Appendix A
Summary of Landscape Blocks and Regions Acres

Table A1 – Summary of Landscape Blocks/acres

Landscape Area 1 Acres	# of Blocks/ Total Acres	% of Landscape Area 1 consisting of identified block sizes (BLM 6,446 ac.)
Blocks less than 100 acres	39/1,696 ac.	26.2% of the area is made up of block sizes less than 100 acres
Blocks between 100-200 acres	18/2,468 ac.	38.0% of the area is made up of block sizes between 100-200 acres
Blocks greater than 200 acres	9/2,282 ac.	35.1% of the area is made up of block sizes greater than 200 acres
Landscape Area 2 Acres	**# of Blocks/ Total Acres**	**% of Landscape Area 2 consisting of identified block sizes (BLM 10,209 acres)**
Blocks less than 100 acres	75/4126 ac.	40.3% of the area is made up of block sizes less than 100 acres
Blocks between 100-200 acres	28/3,821 ac.	37.4%of the area is made up of block sizes between 100 - 200 acres
Blocks greater than 200 acres	9/2,262 ac.	22.2% of the area is made up of block sizes greater than 200 acres

Table A2 – Summary of Block Sizes

Block Sizes	LA-1 -- 6,446 acres BLM	LA-2 – 10,209 acres BLM
100 acres or less	39/1,696 ac/26.2%	75/4,126 ac/40.3%
100-200 acres	18/2,468 ac/38.0%	28/3,821 ac/37.4%
200+ acres	9/2,282 ac/35.1%	9/2,262 ac/22.2%

Table A3 – Summary of Landscape Regions/acres

Landscape Area/ Landscape Region Name	Total # of Acres BLM only	% of Landscape Region with Blocks less than 100 Acres		% of Landscape Region with Blocks 100-200 Acres		% of Landscape Region with Blocks 200 Acres or greater	
Landscape Area 1		**Acres**	**%**	**Acres**	**%**	**Acres**	**%**
Tom/Finn NE	1,062	368	34.6	366	34.5	328	30.9
North Gate	782	544	69.6	238	30.3	0	0
Tom/Finn N	51	51	100.0	0	0	0	0
South Fork Gate	450	450	100	0	0	0	0
Bear Composite N	4,101	283	7.0	1,864	45.4	1,954	47.6
Sub-Total	6,446						
Landscape Area 2		**Acres**	**%**	**Acres**	**%**	**Acres**	**%**
Tom/Finn NW	1,391	845	60.7	546	39.3	0	0
Leaburg Canal N	327	60	18.3	267	81.7	0	0
Leaburg Canal S	761	262	34.4	267	35.1	232	30.5
Tom/Finn S	1,173	646	55.1	527	44.9	0	0
Marten	3,426	1,719	50.2	806	23.5	901	26.3
Bear Composite S	2,243	427	19.0	970	43.1	846	37.9
Deer	879	158	17.9	438	49.8	283	32.3
Ennis	9	9	100	0	0	0	0
Sub-Total	10,209						

Table A4 – Summary of Landscape Regions Ownership

Landscape Area/ Landscape Region Name	Total # of Acres (BLM & Private)	Total # of Acres BLM only	Percent BLM Land	Percent in Non-Reserves	Percent Total in Reserves
Landscape Area 1					
Tom/Finn NE	4,166	1,061	25	64	36
North Gate	18,456	781	4	71	29
Tom/Finn N	763	51	7	41	59
South Fork Gate	12,223	449	4	78	22
Bear Composite N	7,165	4,104	57	57	43
Sub Total	42,775	6,445	15	61	39
Landscape Area 2					
Tom/Finn NW	4,167	1,391	33	74	26
Leaburg Canal N	4,203	327	8	31	69
Leaburg Canal S	5,079	761	15	57	43
Tom/Finn S	4,204	1,174	28	80	20
Marten	9,808	3,426	35	48	52
Bear Composite S	2,416	2,264	94	45	55
Deer	9,834	879	9	24	76
Ennis	5,448	9	0	0	100
Sub Total	45,159	10,209	23	52	48

Appendix B
Small Basin Reserve Descriptions and Selection Information

SMALL BASIN RESERVE DESCRIPTIONS

There are nine small basin reserves in the planning area.

Finn - SBR 1
Indian - SBR 2
Minney - SBR 3
Bear/LSR Extension - SBR 4
Upper Bear - SBR 5
West Fork Deer - SBR 6
Upper Marten - SBR 7
Middle Marten - SBR 8
Gale - SBR 9

As a result of BLM ownership patterns, it should be noted that the Small Basin Reserves do not always consist of topographically complete basins.

FINN – The Finn Small Basin Reserve is 144 acres in size. Approximately one third of the reserve is in a mature-late successional stage. This reserve generally consists of 1st and 2nd order streams with good potential for large woody debris recruitment.

In particular, currently this reserve provides well-distributed patches of mature late-successional habitat on the west side of the planning area, and provides aquatic breeding and terrestrial dispersal habitats for red-legged frogs known to occur in the area.

INDIAN – The Indian Small Basin Reserve consists of 316 acres. Approximately half of this reserve is currently in the mature-late successional forest stage. The west border of the reserve is 1.25 miles of Indian Creek, which is fish-bearing. The northern portion of the reserve contains an area with high mass wasting potential.

In particular, this reserve provides current and future well distributed patches of mature late-successional habitat on the west side of the planning area.

MINNEY

The Minney Small Basin Reserve is 87 acres in size. Approximately one third of this reserve is currently in a mature late-successional forest stage. This reserve is immediately adjacent to 0.5 mile of a fish-bearing section of Minney Creek.

In particular, this reserve provides well distributed patches of mature late-successional habitat on the west side of the planning area, and provides habitat for Cascade torrent salamanders known to occur in the area. The reserve also includes a planned recreation site on North Fork Gate Creek.

BEAR/LSR EXTENSION

The Bear/LSR Extension Small Basin Reserve (SBR-4) consists of 39 acres immediately adjacent to a section of LSR managed by the Willamette National Forest. This entire reserve is currently in a mature late-successional stage.

In particular, this reserve provides undisturbed terrestrial headwall connectivity between subwatersheds in the Adaptive Management Area (AMA) and the adjacent Forest Service LSR. This reserve connects with the Upper Bear Small Basin Reserve and with land originally included in the ACEC nomination. The nature of the connection with the Upper Bear Reserve is primarily through Forest Service administered land. Since the nature of the direct connection with respect to BLM administered lands is small, this reserve is not considered part of the Upper Bear Small Basin Reserve. The entire reserve is within spotted owl critical habitat.

UPPER BEAR

The Upper Bear Small Basin Reserve consists of 1,221 acres. About 75 percent of this reserve is currently in a mature late-successional stage. Key habitat features include intermittent, interrupted, ephemeral, 1st, 2nd, and 3rd order non-fish-bearing streams and headwalls connected by moist, closed canopy, mature age stands with multi-storied old growth. Stream channels in this headwater basin are steep with interspersed areas that have been modeled as having high mass wasting potential. There are recent (i.e., 1996) sluiced areas and several large debris dams. Several miles of fish-bearing streams are included in this reserve.

In particular, this reserve provides key breeding and dispersal refugia for clouded salamanders, tailed frogs, and Cascade torrent salamanders known or suspected to occur in the area. Some special status invertebrates that may be sensitive to minor sediment and temperature fluctuations either in this area or farther downstream are expected to benefit. This reserve also provides aquatic and terrestrial connectivity with the McKenzie River and undisturbed terrestrial headwall connectivity between the subwatersheds in the AMA and the adjacent Forest Service LSR. This reserve is also expected to assist in implementing ACEC objectives. This reserve connects with the Bear/LSR Extension Small Basin Reserve and contains land originally included in the ACEC nomination. The nature of the connection with the Upper Bear Reserve is primarily through Forest Service administered land. In addition, the reserve provides aquatic and terrestrial plant and wildlife refugia in a subwatershed that is almost entirely contained within contiguous BLM managed lands. It includes spotted owl critical habitat and several large TPCC withdrawn areas, and also includes and augments an unmapped LSR spotted owl site core.

WEST FORK DEER

The West Fork Deer Small Basin Reserve consists of 298 acres. About 75 percent of this reserve is currently in a mature late-successional stage. Key habitat features include intermittent, interrupted, ephemeral, 1st, 2nd, and 3rd order non-fish-bearing streams and headwalls connected by moist closed canopy mature age stands. Most of these types of habitats are not buffered by other Aquatic Reserves or planned management. About one mile of fish-bearing stream is known to exist in the reserve.

In particular, this small basin reserve provides key breeding and dispersal refugia for clouded salamanders that are known to occur in the area. Several special status invertebrates that may be sensitive to minor sediment and temperature fluctuations in this area or farther downstream are expected to benefit. Tailed frogs and Cascade torrent salamanders have also been detected in the area. This reserve also provides aquatic and associated terrestrial connectivity with the McKenzie River and will assist in implementing ACEC objectives. It includes and augments a Bald Eagle Habitat Area, and has a ridge top connection with the Upper Marten Small Basin Reserve.

UPPER MARTEN

The Upper Marten Small Basin Reserve consists of 690 acres. About 75 percent of this reserve is in a mature late-successional stage. Key habitat features include intermittent, interrupted, ephemeral, 1st, 2nd, and 3rd order non-fish-bearing streams and headwall areas connected by moist closed canopy mature age stands. Over 1.5 miles of fish-bearing streams are included in the reserve.

In particular, this small basin reserve would provide key breeding and rearing refugia required by tailed frogs, Cascade torrent salamanders, clouded salamanders, and some special status invertebrates that may be sensitive to minor sediment and temperature fluctuations in this area or farther downstream. Survey efforts revealed that this area contains the highest known concentration of tailed frogs on the Eugene BLM District. In addition, this reserve should assist in implementing the ACEC. It includes and augments an unmapped LSR spotted owl core and a large TPCC withdrawn area, and connects with the West Fork Deer Small Basin Reserve.

MIDDLE MARTEN

The Middle Marten Small Basin Reserve consists of 444 acres. Over half of this reserve is in a mature late-successional stage. This reserve connects several areas of potential high mass wasting, and has large trees suitable for LWD stream structure in the event of a natural slope failure. It borders over a mile of fish-bearing stream, and tributaries contribute cold water to Marten Creek. Wildlife key features; and benefits are similar to Upper Marten with consideration for slightly lower elevation habitats.

In particular, this reserve includes a rock garden RMP Special Habitat Area with known populations of *Columbiadoria hallii, Githopsis specularioides, Romanzoffia thompsonii,* and *Viola sheltonii* plant species. This reserve would provide key breeding and dispersal refugia for clouded salamanders that are known to occur in the area, and also benefit several special status invertebrates that may be sensitive to minor sediment and temperature fluctuations. Cascade torrent salamanders and Harlequin ducks have been detected in the area. This reserve also

includes and augments an unmapped LSR spotted owl core and several TPCC withdrawn areas.

GALE

The Gale Small Basin Reserve consists of 230 acres. All of this reserve is currently in a mature late-successional stage. This reserve includes and augments an unmapped LSR spotted owl core.

COLLECTIVE OBJECTIVES OF THE SMALL BASIN RESERVES

As stated in the main body of the document (pp. xx), the small basin reserves described in individual detail above were designed to **collectively** meet the following objectives:

- To be distributed across drainages and elevations in areas of high aquatic habitat diversity
- To contain important stream junctions
- To contain headwaters areas
- To maintain cool microclimates and structure for sensitive species and invertebrate populations
- To encompass and adjoin LSR and/or maintain a distribution of LSR that serve as refugia for LSR dependent species
- To contain areas with concentrations of unstable slopes
- To connect high probability landslide debris flow source areas to the aquatic habitat
- To have high potential to contribute wood and other material through mass soil movements
- To protect areas critical for fulfilling life history requirements of sensitive species
- To be located for the benefit of aquatic and terrestrial plants

SMALL BASIN RESERVE SELECTION INFORMATION

A group of aquatic, wildlife, and botany specialists mapped the list of 16 reserve candidates. For inclusion individual reserve candidates were individually evaluated against a set of criteria. The selection criteria, listed below, and the candidate areas **(*areas considered for selection*)** are depicted with respect to the selection criteria in Table B1.

Criteria 1	Provide contiguous blocks of undisturbed habitat
Criteria 2	Located in areas of high aquatic diversity
Criteria 3	Contain important stream junctions
Criteria 4	Contain headwater areas
Criteria 5	Maintain cool microclimates and structure for sensitive amphibian and invertebrate species and populations; encompass or adjoin LSRs, and/or maintain a distribution of LSRs that serve as refugia for LSR dependent species
Criteria 6	Placed in potential slope instability areas
Criteria 7	Contain wetlands and/or ponds
Criteria 8	Use streamside reserves to connect high probability landslide debris source areas to important aquatic habitat, and has potential to contribute wood and other material through mass soil movements
Criteria 9	Directly protects areas that appear critical to fulfilling life history requirements of sensitive riparian dependent species.
Criteria 10	Located for the benefit of aquatic and terrestrial plants.

Table B1 – Criteria for Selection Small Basin Reserves

Candidate Area #	Basin Results	Notes	Criteria – (Y = yes; U = unknown; N = No)									
			1	2	3	4	5	6	7	8	9	10
1	SBR-8 – Middle Marten	Combined with Candidate Area 7 to become SBR-8	U	U	Y	U	Y	U	U	Y	U	U
2	Dropped	Small (40 acres) that did not fit with the small basin concept	U	U	Y	U	Y	U	U	U	U	U
3	SBR-5 – Upper Bear	All of this Candidate Area was incorporated into SBR-5. Note, this Candidate Area overlapped with Areas 8 and 11. Much of the dropped area includes TPPC and other already reserved areas.	U	U	Y	U	Y	U	U	Y	U	U
4	Dropped	This reserve was dropped to facilitate the creation of a large reserve in the headwaters of Bear Creek (SBR-5) immediately adjacent to Candidate Area 4.	U	U	Y	U	Y	U	U	Y	U	U
5	SBR-7 Upper Marten	Combined with CandidateArea 10 to become SBR-7.	Y	Y	U	Y	Y	Y	U	U	Y	Y
6	SBR-6 West Fork Deer	Became SBR-6	U	U	U	Y	Y	Y	U	U	Y	Y
7	SBR-8 Middle Marten	Combined with Candidate Area 1 to become SBR-8	U	U	U	Y	Y	U	U	U	Y	U
8	SBR-5 Upper Bear	Part of this Candidate Area was incorporated into SBR-5. Note, this Candidate Area overlapped with areas 3 and 8.	Y	Y	U	Y	Y	Y	U	U	Y	Y
9	SBR-4 Bear/LSR Ext.	Part of this Candidate Area became SBR-4.	Y	Y	U	Y	Y	Y	U	U	Y	Y
10	SBR-7 Upper Marten	Combined with Candidate Area 5 to become SBR-7	Y	Y	Y	Y	Y	Y	U	Y	U	Y
11	SBR-5 Upper Bear	All of this Candidate Area was incorporated into SBR-5. Note, this Candidate Area overlapped with areas 3 and 8.	Y	U	Y	Y	Y	Y	U	Y	U	Y
12	SBR-2 Indian	Provided spatial representation of small basin reserves in western part of the planning area.	U	U	Y	U	Y	U	U	U	U	U
13	SBR-1 Finn	Provided spatial representation of small basin reserves in western part of the planning area	U	U	Y	U	Y	U	U	Y	U	U
14	SBR-2 Minney		U	U	Y	Y	Y	Y	U	N	U	U
15	SBR-9 Gale		U	U	U	Y	Y	U	U	U	U	U
16	Dropped	This reserve was dropped to facilitate the creation of a large reserve in the headwaters of Bear Creek.										

- Candidate Area – Area considered for selection

In the evaluation process, it was discovered that the criteria were not especially useful for comparing the basins to each other for the purpose of making final selections. In general, the candidate areas either met the criteria or there was not enough information to make a determination. Since there was not enough information available to develop a reasonable set of new criteria to help **distinguish between** the candidate areas, a different approach was taken.

Three options, using various combinations of the candidate areas were developed. The philosophy behind the options was:

Option 1 – have a few larger reserve areas that are not well distributed;
Option 2 – have many smaller reserves that are well distributed; and
Option 3 – an option that focuses on developing Small Basin Reserves that are true hydrologic and topographic basins.

Option 2 was selected with a few minor modifications, and the results are shown in Table B-1. Option 2 provided the best opportunities for good spatial and elevational distribution of reserves. In addition, because of overlapping candidate areas, it was possible to combine some candidate areas to form larger reserves with more interior forested habitat than originally expected.

Option 3 was the least feasible of the options because the BLM ownership pattern was very limiting. Option 1 was basically one large reserve in Bear Creek and three smaller reserves that, overall, did not provide a spatial distribution that was acceptable.

Appendix C
Analysis Steps for Spatial and Temporal Projection

The following are the analysis steps used in developing the spatial and temporal projection of the landscape plan:

1. The GIS (Geographic Information System) and FOI (Forest Operations Inventory) information for the AMA was compiled, and the information was split into identified blocks (see section 2). Block information was then split into the portion of reserve and base for each block (Base acres are those not reserved and available for harvest.). Once this split was accomplished, each block and its age information was entered in spreadsheets and predictions of future progress were made by aging the stand. Because this is an area and not a volume control projection, the stands were aged in class but not changed in volumes. Only volumes typical of the age classes were used. When a stand shifted age, volumes for the new age class were used when needed. This is a simpler method than the more demanding volume control type of harvest scheduling used for this calculation during the RMP planning.

2. Harvest units were selected in accordance with the guidance criteria and returned to the first decade age class as they were harvested. At each decade, key indicators such as seral stage, age class distribution, and spatial relationships between harvest units and their surrounding blocks were evaluated against the criteria for harvest selection. This process was continued for 10 decades. In this document there are age class maps and tables showing age class distribution.

3. The purpose of this projection is to develop an understanding of the effects of the landscape plan on the spatial distribution of forest types that emerge from the application of this area control block patchwork. A pattern that emphasized the placement of harvest units so that they tended to avoid other harvest units was selected. For comparison purposes, a similar analysis was completed using a harvest schedule that applies the Eugene District RMP harvest system.

4. Finally, volume projections were run. The first step was to prepare a sample of stands to develop stand averages, which could be applied to treated acres, that came out of the area control projection. Over 2,000 acres have been harvested in the AMA in the last two decades. For this set of old timber sales, approximately 860 acres of sales have available stem diameter distributions. These distributions were used in calculations for volumes using typical single tree volume tables that were checked against the actual sale volumes to confirm the analysis results.

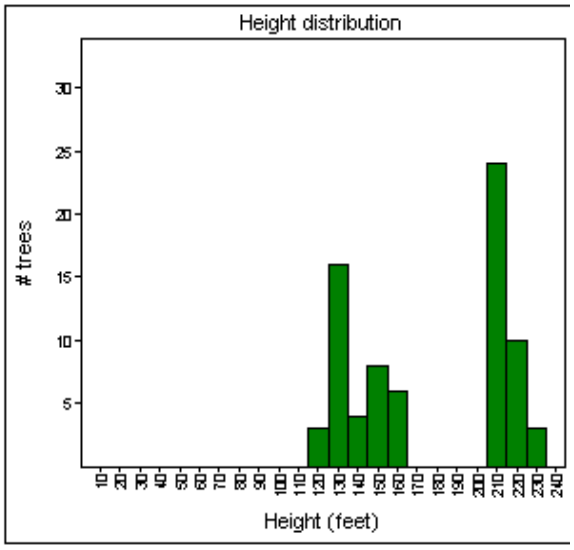
5. The individual stands were manipulated to determine estimates of volume produced under certain silvicultural prescriptions, crown closure, and other important stand parameters such as basal area, quadratic mean stand diameter, relative density, and average crown diameter. These important stand parameters were used to verify the predictions and outcomes of using the silvicultural prescriptions on stands along with knowledge of stand responses and published silvicultural research.

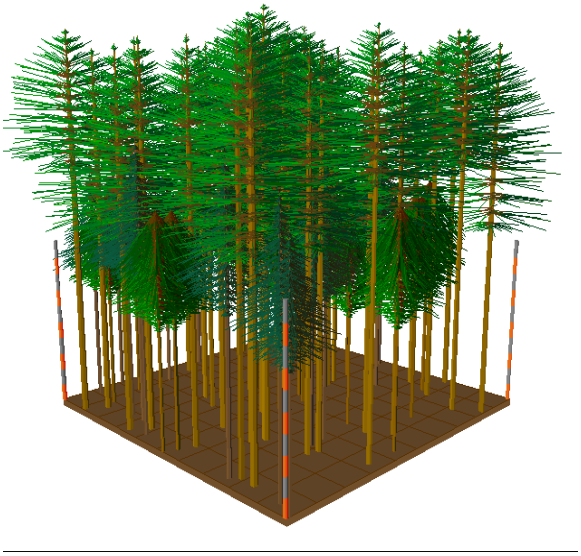
6. Finally, a composite stand **was built** using the sampled stands, and this composite stand was used to evaluate the results of the snag and CWD requirements, and to verify projections previously run on individual old sale unit cruise data. This was felt to be the most reliable modeling method as stand exam data did not exist, and forest inventory data was limited to a few plots.

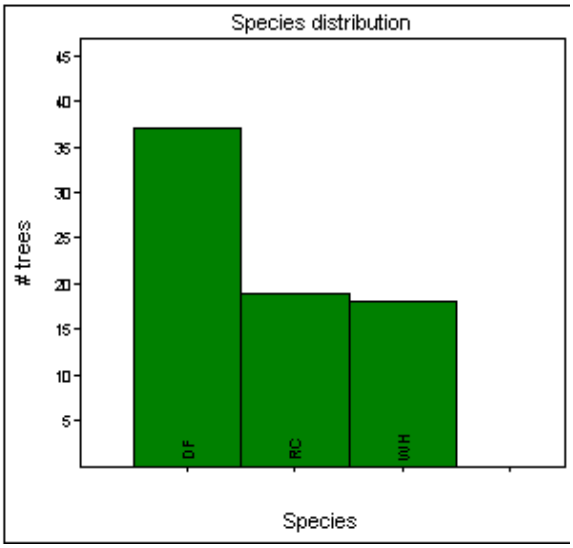
7. Once anticipated volume levels from treatments were developed, the total volume was estimated from the acres treated and the volume per acre by treatment. The treated acres were derived using the output from the temporal projection and the projected population of acres of the age classes where the silvicultural prescription proposed treatment. For example, the total volume for a decade would be the acres of regeneration harvest times the volume/acre for regeneration harvest, plus the volume for each of 3 thinning types, 40, 70, and 100 year times the acres for that decade in the proper age class.

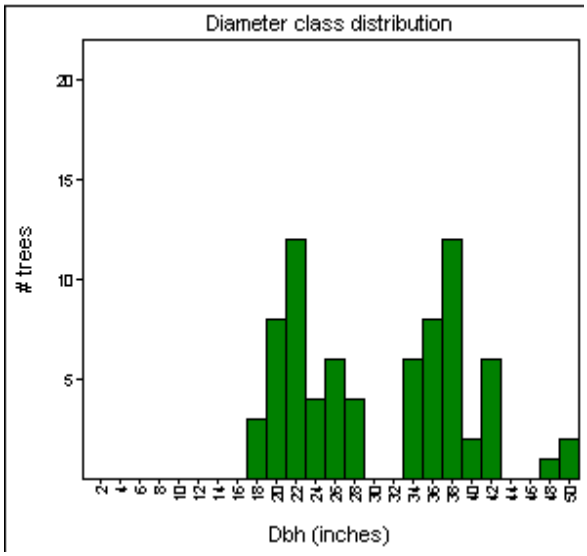
8. Not included in the analysis for volume are two types of possible treatments. First, some thinning may be desirable within reserve areas, where these actions will help to maintain or improve the values for which these areas were set aside. Next, initial thinnings of certain age classes prior to final harvest are not included. Both of these types of volume will be site specific, and may or may not be needed.

9. The figures below were developed using a model to project stand characteristics under the MMLD. The model was used to show whether under the MMLD, the desired stand complexity would occur.









Appendix D
Riparian Reserve Module Analyses

Table D-1 shows vertebrate species known or suspected to occur within the planning area and a brief description of their habitats.

Table D-2 describes BLM Special Status invertebrates known or suspected to occur within the planning area and a brief description of their habitats. These species were not fully analyzed in the Riparian Reserve Module and associated analyses due to lack of information on their habitat requirements and occurrence within the planning area.

Table D-3 describes how dependent species are on riparian habitats. Those that most benefit from and are most dependent on riparian habitats are highlighted in shaded blocks.

Table D-4 describes the ecological classification for species in the shaded blocks in Table D-3.

In the ecological classification of species for preliminary vulnerability assessment, some species were eliminated or reclassified in a category different from where they were found in the "Riparian Reserve Module" (*Riparian Reserve Evaluation Techniques and Synthesis document; Supplement to Section II of Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis (version 2.2).* This was a result of additional biological or distribution information not available at the time the module document was written. For example, *Tritomaria exsectiformis*, defined as localized and rare and exclusive and restricted in this document, is now known to have a distribution beyond a single physiographic province and is included in the widely distributed and rare, exclusive and restricted category. *Kurzia makinoana*, a species included in the localized and rare and exclusive and restricted category in this document, was eliminated from the assessment because it was determined that it was not likely to be found within the AMA (J. Christy and D. Wagner, personal communications). *Prophysaon dubium* was defined as localized and rare, and exclusive and restricted. Survey information has determined this species is more common and not dependent on riparian habitats, and was excluded from riparian reserve analyses.

Table D-1

MMLD – Analysis of Species Associated with Riparian Reserves. Plant and Wildlife Species Dependent on or Benefitted by Riparian Reserves As Analyzed in the "Riparian Reserve Module" (*Riparian Reserve Evaluation Techniques and Synthesis document; Supplement to Section II of Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis (version 2.2*)).

Riparian Reserve Module List # [A]	SPECIES	Riparian Obligates [B]	Riparian Associates [C]	Presence in Planning Area D = documented S = suspected/ probable U = Unlikely	COMMENTS
			INVERTEBRATES		
3 SS	Special Status (18 species)	X		S – 16 species U – 2 species	Habitat requirements are generalized in Table D-2
			AMPHIBIANS & REPTILES		
1, 2	Cascade Torrent Salamander *(Rhyacotriton cascadae)*	X		D	Restricted to cold, well-oxygenated seeps, springs, and 1st-2nd order streams (≤ 13 deg. Celsius) below 4,000 feet. Generally associated with LSF. Larvae use intermittent and ephemeral streams. Vulnerable to local extinction from water quality decline (e.g., activities that contribute to silt or increased temperature in streams and loss of stream stability and vegetation), and forest fragmentation. Poor dispersal capabilities.
2	Northwestern Salamander *(Ambystoma gracile)*	X		D	Deep and shallow ponds for breeding. Some terrestrial habitats for dispersal and during rainy periods. Elevations below 6,000 feet.
2	Pacific Giant Salamander *(Dicamptodon tenebrosus)*	X		D	Low to mid order streams for breeding and larva protection. Larvae use intermittent and ephemeral streams and seeps. Some terrestrial habitats for dispersal/travel during rainy periods.
2	Rough-skinned Newt *(Taricha granulosa)*	X		D	
3 @ SS	Northern Red-legged Frog *(Rana aurora)*	X		D	Partially shaded quiet shallow ponds less than 3 meters deep, upslope or adjacent to streams for breeding. May use low gradient streams. Some terrestrial needs for dispersal and non-breeding habits. Vulnerable to bullfrog and introduced warm water fish predation. Usually below 2,000 feet. Uses terrestrial habitats when not breeding.

Riparian Reserve Module List # [A]	SPECIES	Riparian Obligates [B]	Riparian Associates [C]	Presence in Planning Area D = documented S = suspected/ probable U = Unlikely	COMMENTS
1, 2	Tailed Frog *(Ascaphus truei)*	X		D	Specialized adaptations to high gradient clean, cold, swift rocky streams (14-18 deg. Celsius) below 6,500 feet. May concentrate in low order streams if Pacific giant salamanders or salmonids present in same drainage. Vulnerable to increases in silt and water temperatures and forest fragmentation, including disturbance in riparian zones. Generally prefers LSF but found in mid to mature age forests. May inhabit stream edges and uplands in rainy periods. Dispersal/breeding connectivity through uplands.
3 SS	Western Pond Turtle *(Clemmys marmorata)*	X		S known locations east and west of planning area	Sunny locations in low gradient streams and ponds with emergent vegetation. Potential locations at lower elevations near McKenzie River. Vulnerable to bullfrog and warm water fish species predation, invasive riparian vegetation (e.g., Himalaya blackberries), and disturbance in nesting areas at all times of the year. Probably present at elevations under 2,000 feet.
3 SS	Cascades Frog *(Rana cascadae)*	X		U unlikely due to absence of higher elevation habitats	Cold (≤ 14 degrees Celsius) clear, quiet bogs, ponds, and low gradient streams with adequate sunlight for breeding; usually above 3,000 feet. Some stream and terrestrial habits for foraging and dispersal. Vulnerable to breeding habitat degradation and UV-B sunlight.
3 SS	Clouded Salamander *(Aneides ferreus)*		X	D	Large diameter conifer class 3+ dwd and rotten snags plus rocky outcrops in mesic conifer forests essential. Long-term presence of LSF components necessary for healthy populations but may be found in younger forests. Not directly dependent on streams or ponds for any part of life history but benefits from moist microclimates provided by healthy riparian corridors. Possible habitats at all elevations below 5,000 feet. Vulnerable to disturbances that reduce dwd or mesic microclimates.

Riparian Reserve Module List # [A]	SPECIES	Riparian Obligates [B]	Riparian Associates [C]	Presence in Planning Area D = documented S = suspected/ probable U = Unlikely	COMMENTS
3 @ SS	Oregon Slender Salamander *(Batrachoseps wrightii)*		X	S	Large diameter conifer class 3+ dwd and rotten snags plus rocky outcrops in mesic conifer forests essential. Long-term presence of LSF components necessary for healthy populations but may be found in younger forests. Not directly dependent on streams or ponds for any parts of life history but benefits from moist microclimates provided by healthy riparian corridors. Vulnerable to local extirpation due to current habitat fragmentation and suspected naturally patchy distribution and disturbances that destroy most/all woody debris or disrupt dispersal corridors. At elevations below 4,500 feet.
1, 2	Dunn's Salamander *(Plethodon dunni)*	X		D	Inhabits rocky or dwd edges of forest streams or permanently wet/moist talus.
			BIRDS		
3 TE	Northern Bald Eagle *(Haliaeetus leucocephalus)*		X	S known perch and forage locations, no known mid-winter roosts or nests	Mature to LSF near rivers and lakes/large ponds for roosting and nesting.
3 @ SS	Mountain Quail *(Oreortyx pictus)*		X	D	Grass-forb, shrub, and sapling pole stands, including recent burns.
3 @ SS	Northern Pygmy Owl *(Glaucidium gnoma)*		X	D	Mid to late-seral stands with high densities of large snags for nesting and roosting.
3 @	Northern Saw-whet Owl *(Aegolius acadicus)*		X	D	Mid to late-seral stands with high densities of large snags for nesting and roosting.
3 SS PB	Great Gray Owl *(Strix nebulosa)*		X	S	Mid to high elevation conifer forests (1500–5000 feet) adjacent to wet and dry meadows for foraging, and adequate snags for nesting in stands with at least 40% canopy cover. Probably more common above 3,000 feet.
2	Northern Spotted Owl *(Strix occidentalis)*		X	D	Contiguous tracks of mature to LSF with ample cwd, complex canopy structures, low brush, and suppressed canopy layers and high densities of live/dead snags for nesting and down wood for prey base.
3 SS	Peregrine Falcon *(Falco peregrinus)*		X	S suitable nesting structure available	Benefits from foraging in riparian areas.
1	Common Merganser *(Mergus merganser)*	X		D	Lakes. ponds, and larger streams in/near mature -Late seral forests

Riparian Reserve Module List # [A]	SPECIES	Riparian Obligates [B]	Riparian Associates [C]	Presence in Planning Area D = documented S = suspected/ probable U = Unlikely	COMMENTS
3 @ SS	Harlequin Duck *(Histrionicus histrionicus)*	X		D	Clear and cold low gradient streams with adequate sunlight and intact riparian vegetation and cover. Vulnerable to silt inputs affecting invertebrate populations and human disturbance April through July.
3 SS	Purple Martin *(Progne subis*)		X	S	Available nesting sites in dead/burned snags in/near open areas, meadows, and water for foraging.
		MAMMALS			
1, 2	Fringed Myotis *(Myotis thysanodes)*	X		D	**BATS IN GENERAL** (all species): As a group, all bats are SEIS Special Attention Species in the Northwest Forest Plan and the Eugene RMP (1995) and are in a unique category with additional management direction provided in these documents. Roosting, breeding, and hibernacula sites can be in snags, stumps, rock outcrops, caves, bridges and other human made structures near foraging resources (primarily water). The type and quantity of forage and roosts sites varies by species. All species are vulnerable to disturbance to maternity sites.
1, 2	Hoary Bat *(Lasiurus cinereus)*	X		D	
1, 2	Long-eared Myotis *(Myotis evotis)*	X		D	
1, 2	Long-legged Myotis *(Myotis volans)*	X		D	
1, 2	Pacific Pallid Bat *(Antrozous pallidus)*	X		S known to occur in McKenzie River watershed	
1, 2	Silver-haired bat *(Lasionycteris noctivagans)*	X		D	
1, 2	Yuma Myotis *(Myotis yumanensis)*	X		D	
3 see comments	Big Brown *(Eptesicus fuscus)*	X		S	
3 see comments	California Myotis *(Myotis californicus)*	X		S	
3 see comments	Townsend's Big Eared *(Plecotus townsendi)*	X		S	

Riparian Reserve Module List # [A]	SPECIES	Riparian Obligates [B]	Riparian Associates [C]	Presence in Planning Area D = documented S = suspected/ probable U = Unlikely	COMMENTS
1	Fisher *(Martes pennanti)*		X	U possible but unlikely due to rarity	Large tracts of interior, closed canopy forests from near sea level to alpine areas. Often in riparian corridors; occasionally use cut-over habitats. Naturally low densities. More common in mature LSF habitats. High amounts of large diameter cwd. Rare and less likely to occur in planning area than martens.
1	Marten *(Martes americana)*		X	S possible	Large tracts of interior, closed canopy forests from near sea level to alpine areas. May be more common in mature LSF habitats. High amounts of large diameter cwd. Naturally low densities.
2	Red Tree Vole *(Phenacomys longicaudus)*		X	S likely to occur	Mid, Mature, and LSF Douglas-fir dominated forests with ample free water (rain or fog drip), closed canopies, and suitable tree/crown structure for nests. Vulnerable to habitat fragmentation and local population isolation due to low fecundity and dispersal patterns plus patch size necessary for breeding colonies. Healthy populations more common in LSF forests.
1	Western Red-backed Vole *(Phenacomys albipes)*		X	S likely to occur	Moist mid to LSF conifer forests with large amounts of dwd. May use rock outcrops.
3 @ SS	White Footed Vole *(Phenacomys albpipes)*	X		D	Sapling pole to LSF with high densities of dwd in/near riparian habitats for most parts of life history. Apparent association with hardwoods and small streams. Uncommonly detected.
			LICHENS		
3	*Hypotrachyna riparia*		X	S	Newly described by McCune (1998); found growing on riparian hardwoods (one specimen was found on Oregon ash). Only two specimens have ever been found.
2	*Bryoria pikei*		X	S	Pendulous “forage” lichen, very rare, Western Cascades.
1	*Cetrelia cetraroides*		X	D	A foliose lichen species found in the riparian zone; most often growing on *Alnus rubra*, but occasionally on other hardwoods, and rarely on conifers.
1	*Dermatocarpon luridum*	X		S	Foliose lichen that grows on streamside or lakeside rocks where frequently wetted.
1	*Hydrothyria venosa*	X		U	Aquatic, foliose lichen growing in cold, clear streams that never flood (usually high elevations in the Cascades).

Riparian Reserve Module List # [A]	SPECIES	Riparian Obligates [B]	Riparian Associates [C]	Presence in Planning Area D = documented S = suspected/ probable U = Unlikely	COMMENTS
3	*Hypotrachyna revoluta*		X	U	Foliose lichen that grows on bark and rock; may be restricted to Coast Range.
1	*Leptogium rivale*	X		S	Aquatic, foliose lichen that grows on siliceous rocks.
1	*Leptogium cyanescens*		X	S	Small foliose lichen that grows on bark, rotten logs and rocks.
1	*Leptogium saturninum*		X	S	Small, foliose lichen that usually grows on bark of hardwoods, occasionally conifers, and rarely grows on rock.
3	*Pannaria rubiginosa*		X	S	Rare and scattered in the W. Cascades; found on bark and wood of both hardwoods and conifers.
1	*Usnea longissima*		X	D	Not uncommon, but with very patchy distribution, possibly because of dispersal limitations.
BRYOPHYTES					
3	*Sphaerocarpos hians*	X		S	Ephemeral, thalloid liverwort that grows on mud of receding streams and rivers. If in the AMA, it would be along larger order streams or the McKenzie River at lower elevations.
3	*Crumia latifolia*		X	S	Moss that forms dense cushions on wet rocks or cliff faces, usually calcareous. May be submerged in flowing streams or on cement.
3	*Plagiochila satoi*		X	S	Leafy liverwort reported from low elevation riparian forests, on cliffs, rocks and bark.
3	*Platyhypnidium riparioides*	X		S	Aquatic moss that grows attached to stones in or at the edge of streams.
3	*Racomitrium aquaticum*	X		S	Moss found on wet rocks along streams, above 660m elevation.
1	*Scouleria marginata*	X		S	Found on rocks in spray zones of streams and waterfalls where the water is clean and cold, from lowlands to 700m.
1	*Tritomaria exsectiformis*	X		S	Liverwort that grows on peaty or humic soil or rotting wood, often on creek banks, especially near spring heads. In Oregon it has been found on peaty soil near middle elevation, cold water streams.
VASCULAR PLANTS					

Riparian Reserve Module List # [A]	SPECIES	Riparian Obligates [B]	Riparian Associates [C]	Presence in Planning Area D = documented S = suspected/ probable U = Unlikely	COMMENTS
1, 2, 3	*Botrychium minganense* (BLM Bureau Assessment; S&M List1& 2)	X		S	Shady cedar (*Thuja plicata*) swamps; generally near water at mid-elevations, 1500–1800meters; Wallowa, Harney, Linn, Wasco, Douglas counties, OR Currently know from South Valley Resource Area, Eugene District BLM.
1, 2, 3	*Botrychium montanum* (BLM Bureau Assessment; S&M List 1 & 2)	X		S	Shady coniferous woods, edge of bogs, cedar swamps; 1500–1800 meters; N. Cascades, N. Rocky Mountains, Grant and Marion Counties, Oregon.
1, 2	*Allotropa virgata* (Survey and Manage 1&2)		X	D	Lower elevation coniferous forests, especially open, dry ridges, 75–3,000 meters; B.C. to California; found in all Eugene District Resource Areas.
1, 2	*Cimicifuga elata* (BLM Bureau Tracking/ (Interagency Conservation Strategy)		X	D	Moist shady woods, open canopy, at lower elevations, often found with big leaf maple in overstory; always dominant swordfern ground cover; north to northeast-facing steep slopes; mid-slope; sometimes near streams; S B.C to NW Oregon; Douglas, Lane, Linn, Marion, Multnomah, Polk, and Yamhill Counties. Found in all Eugene District Resource Areas.
1	*Asplenium trichomanes* ssp. *trichomanes* (Lane County Sensitive)	X		S	Rock cliff crevices and talus slopes where moist; around 200 meters; rare in California, Oregon, widespread in North America
1	*Botrychium virginianum* (Eugene District Review)		X	D	Moist wood and thickets; seldom in meadows: valleys to mid-mountain, swampy areas and edges, salt marshes near coast; West Cascades to west central California; found in all Eugene District Resource Areas.
1	*Carex acrta* (Lane County Sensitive)	X		S	Wet places, esp. sphagnum bogs; west slope of Cascades at mid/high elevations and on valley floor. Northern California to Western Canada; ½ mile S of Eagles Rest.
1	*Corallorrhiza trifida* (Lane County Sensitive)		X	S	Moist shaded areas; mountains to subalpine, often near creeks; 1400–1700 meters; Alaska to Labrador, S to N California, Idaho; McKenzie Pass at 1,700 meters
1	*Epilobium luteum* (BLM Tracking)	X		U	Moist ground, stream banks, meadows, mid to high elevations; Alaska to Oregon Cascades. Within the Eugene District occurs in South Valley Resource Area.

Riparian Reserve Module List # [A]	SPECIES	Riparian Obligates [B]	Riparian Associates [C]	Presence in Planning Area D = documented S = suspected/ probable U = Unlikely	COMMENTS
1	*Gymnocarpium dryopteris* (Lane County Sensitive)	X		S	Streambanks, moist shady woods, and wet cliffs, low to medium elevation; Oregon to Arizona, east to Virginia.
1	*Romanzoffia thompsonii* (BLM Bureau Sensitive)	X		D	Cliff seeps and wet meadows on south facing slopes; usually steep, open drainage slopes; 400– 1900 meters; Douglas, Jackson, Lane, Linn, Marion Counties; Within Eugene District occurs within McKenzie Resource Area.
1	*Carex gynodynama* (BLM Assessment)	X		S	Wet meadows; open forests; less than 600 meters; California; Eugene District, South Valley Resource Area.
1	*Carex mendocinensis* (Lane County Sensitive)	X		S	Moist to wet meadows; often serpentine; 150--1,600 meters; N California to S Oregon; South Valley and McKenzie Resource Areas.
1	*Epilobium luteum* (BLM Tracking)	X		S	Moist ground, stream banks, meadows, mid to high elevations; Alaska to Oregon Cascades; South Valley Resource Area.
1	*Epipactis gigantea* (Eugene District Review)	X		S	Sometimes in Carex patches along streambanks, lake margins, and near springs and seepage areas; back coastal dune wet areas, also on bare rocks; less than 2,500 meters; BC to N Mexico, W to Rocky Mts.
1	*Euonymus occidentalis* (BLM Tracking)		X	S	Woods, shady mixed-species riparian zone; less than 2000 meters; W Cascades, Lewis Co. WA to central CA; South Valley Resource Area
1	*Gymnocarpium dryopteris* (Lane County Sensitive)	X		S	Streambanks, moist shady woods, and wet cliffs, low to medium elevation; Oregon to Arizona, East to Virginia.
1	*Mimulus cardinalis* (Eugene District Review)	X		S	Riparian areas, seepage areas; less than 2,400 meters; S Willamette Valley to UT, AZ, CA; South Valley Resource Area.

Note: For many rare non-vascular plant species, the extent of the species' dependence upon riparian habitat is unknown.
For the purpose of this table, only aquatic and semi-aquatic species were considered riparian obligates (B).

Notes for Table D-1:

A. Riparian Reserve Scenario from Riparian Reserve Module List # :

1 = List 1 – Species Benefitting from Riparian Reserve Scenario 1 (Species may or may not pass the 80% screen):

Fish Bearing Streams	2 Site Potential Trees – all watersheds
Non-fish Perennial Streams	1 Site Potential Tree – all watersheds
Intermittent Streams	1 Site Potential Tree

2 = List 2 – Species Protected by Riparian Reserve Scenario 2 (Species passed the 80% Screen);

Fish Bearing Streams	2 Site Potential Trees – all watersheds
Non-fish Perennial Streams	1 Site Potential Tree – all watersheds
Intermittent Streams	Tier 1 Key Watershed – 1 Site Potential Tree,
	Tier 2 Key Watershed – ½ Site Potential Tree
	All Other Watersheds – ½ Site Potential Tree

3 = List 3 – Additional local species of concern not addressed in the Riparian Reserve Module vers. 2.2

@ = Species in original ACEC nomination within the planning area

Contributing reasons why List 3 species were included in riparian analyses:

TE = Federally listed threatened or endangered species
SM = Survey and Manage species
PB = Protection Buffer species
SS = Bureau Special Status species

B. Species is Riparian dependent for most/all life history needs.

C. Uses/benefits from Riparian Areas but not dependent for Most/All Life History Needs

DWD = down woody debris
CWD = coarse woody debris
LSF = late-successional forest/characteristics

Table D-2 – Survey & Manage and BLM Special Status Invertebrate Species in the MMLA These Species (except for Survey & Manage Mollusks) Were Not Analyzed in the Riparian Reserve Module Due to Insufficient Information					
SPECIES	**Presence in Planning Area** **D** = documented **S** = suspected/ probable	**Riparian Obligates** [B]	**Riparian Associates** [C]	**Upland Associated**	**COMMENTS**
Coleoptera (beetles)					
Acneus beeri	S	X			permanent shaded 1st order streams
Nebria piperi	S	X			large stream banks
Hemiptera (bugs)					
Boreostolis americana	S	X			clean, relatively cold and rocky streams
Hoplistoscelis heidemanni	S	X			stream banks
Odonata (dragonflies)					
Tanypteryx hageni	S	X			bogs and ponds
Trichoptera (caddisflies)					
Apatania tavala	S	X			clean, relatively cold streams
Ceraclea vertreesi	S	X			clean, relatively cold streams
Eobrachycentrus gelidae	S	X			clean, permanent, shaded and cold 1st order streams/seeps
Farula reapiri	S	X			permanent and shaded 1st order streams/seeps
Limnephilus atercus	S	X			sun warmed ponds/streams with aquatic vegetation
Ochrotrichia alsea	S	X			clean and relatively cold rocky streams
Ochrotrichia vertreesi	S	X			clean and relatively cold rocky streams
Oligophlebodes mostbento	S	X			clean and relatively cold rocky streams
Rhyacophila fenderi	S	X			clean and relatively cold rocky streams
Rhyacophila unipunctata	S	X			permanent and shaded 1st order streams/seeps
Tinodes siskiyou	S	X			clean and relatively cold rocky streams
Mollusca (slugs & snails)					
Pristine springsnail *Pristinicola hemphilli*	S	X			Clean, spring fed and rocky 1st order streams/seeps with permanent shade
Pristoloma crateris arcticum	unlikely based on local knowledge	X			Suspected habitats: leaf litter under brush in/near riparian zone communities

Table D-2 – Survey & Manage and BLM Special Status Invertebrate Species in the MMLA

These Species (except for Survey & Manage Mollusks) Were Not Analyzed in the Riparian Reserve Module Due to Insufficient Information

SPECIES	Presence in Planning Area **D** = documented **S** = suspected/ probable	Riparian Obligates [B]	Riparian Associates [C]	Upland Associated	COMMENTS

B Species is Riparian dependent for most/all life history needs.
C Uses/benefits from Riparian Areas but is not dependent for Most/All Life History Needs

Summary of Invertebrates by Habitat Types		Comments on Habitat
Invertebrates (1)		**Invertebrates (1)** Very clean and cool, often rocky streams, especially 1st – 3rd order. Presence of tailed frogs may be one indicator of suitable habitat.
Apatania tavala, Cascade	Apatanian Caddisfly	
Ceraclea vertreesi	Vertrees's Ceraclean Caddisfly	
Hoplistoscelis heidemann	Heidemann's Nabid (bug)	
Nebria piper	Piper's Gazelle Beetle	
Ochrotrichia alsea	Alsea Ochrotrichian Microcaddisfly	
Ochrotrichia vertreesi	Vertrees's Ochrotrichian Microcaddisfly	
Oligophlebodes mostbento	Tombstone Prairie Oligop. Caddisfly	
Rhyacophila fenderi	Fender's Rhyacophilan Caddisfly	
Tinodes siskiyou	Siskiyou Caddisfly	
Invertebrates (2)		**Invertebrates (2)** Shaded perennial 1st order stream, springs, and seeps.
Eobrachycentrus gelidae	Mt Hood Prim. Brachycent Caddisfly	
Earula reapiri	Tombstone Praire Farulan	
Rhyacophila unipunctata	One-spot Rhaycophilan Caddisfly	
Invertebrates (3)		**Invertebrates (3)** Damp riparian zone vegetation
Pristoloma arcticum crateris	Crater Lake Tightcoil (snail)	
Prophysaon coeruleum	Blue-gray Tail-dropper (slug)	
Prophysaon dubium	Pappillose Tail-dropper (slug)	
Limnephilus atercus	Fort Dick Limnephilus Caddisfly	
Tanypteryx hageni	Montane Bog Dragonfly	**Invertebrates (4)** Small to medium size bogs, ponds (natural or constructed), or slow moving streams with some sun and vegetation.
Invertebrates (4)		
Limnephilus atercus	Fort Dick Limnephilus Caddisfly	
Tanypteryx hageni	Montane Bog Dragonfly	

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Table D-3 –Analysis of Wildlife, Lichens, Bryophytes and Vascular Plant Species, Associated with Riparian Reserves in the MMLA
Ecological Classification of Species for Preliminary Vulnerability Assessment (Riparian Reserve Module)

	Localized and Rare	Widely Distributed and Rare or Localized and Common	Widely Distributed and Common
Exclusive and Restricted	**Lichens and Bryophytes** *Hypotrachyna riparia* 3 *Sphaerocarpos hians* 3 **Vascular Plants** *Botrychium montanum* (BLM Assessment)	**Amphibians & Reptiles** Tailed Frog Red-legged Frog Western Pond Turtle Cascade Frog Cascade Torrent Salamander White-footed Vole Dunn's Salamander **Lichens and Bryophytes** *Bryoria pikei* 2 *Cetrelia cetraroides* 1 *Crumia latifolia* 3 *Dermatocarpon luridum* 1 *Hydrothyria venosa* 1 *Leptogium rivale* 1 *Leptogium cyanescens* 1 *Leptogium saturninum* 1 *Pannaria rubiginosa* 3 *Plagiochila satoi* 3 *Platyhypnidium riparioides* 3 *Racomitrium aquaticum* 3 *Scouleria marginata* 1 *Tritomaria exsectiformis* 1 *Usnea longissima* 1 **Vascular Plants** *Botrychium minganense* (BLM Assessment) *Romanzoffia thompsonii* (BLM Bureau Sensitive) *Asplenium trichomanes ssp. trichomanes* (Lane County Sensitive) *Mimulus cardinalis* (Lane County Sensitive) *Epipactus gigantea* (Eugene District Review	**Bats** Little Brown Myotis Yuma Myotis **Amphibians** Pacific Giant Salamander Northwestern Salamander **Vascular Plants - none**
Exclusive and Broad	None in planning area	**Birds** Harlequin Duck **Vascular Plants** *Carex gynodynama* (BLM Assessment) *Carex arcta* (Lane County Sensitive) *Epilobium luteum* (BLM Tracking) *Carex mendocinensis* (Lane County Sensitive)	**Birds** Common Merganser **Amphibians** Rough-skinned Newt **Lichens and Bryophytes** *Lobaria hallii* 3 **Vascular Plants - none**

	Localized and Rare	Widely Distributed and Rare or Localized and Common	Widely Distributed and Common
Supplemental and Restricted	*Hypotrachyna revoluta* 3	**Mammals-Including Bats** Fisher Marten Red Tree Vole Western Red-backed Vole **Lichens and Bryophytes** *Alectoria lata* 2 *Alectoria vancouverensis* 2 *Brotherella roellii* 3 *Bryoria tortuosa* 3 *Cladonia cenotea* 2 *Cladonia norvegica* 3 *Cladonia bacillaris* 2 *Collema nigrescens* 1 *Diplophyllum albicans* 3 *Douinia ovata* 1 *Hypogymnia duplicata* 3 *Hypogymnia oceanica* 3 *Leptogium burnetiae* var. *hirsutum*1 *Leptogium gelatinosum* 2 *Leptogium teretiusculum* 1 *Lobaria linita* 3 *Nephroma bellum* 3 *Nephroma parile* 3 *Nephroma occultum* 3 *Pannaria leucostictoides* 3 *Pilophorus clavatus* 2 *Pilophorus acicularis* 2 *Platismatia lacunosa* 1 *Pseudocyphellaria rainierensis 3* *Psoroma hypnorum* 2 *Ramalina thrausta* 1 *Tetraphis geniculata* 3 *Thamnobryum neckeroides* 2 *Tholurna dissimilis* 3 *Xylographa vitiligo* 2 **Vascular Plants** *Allotropa virgata* (Survey and Manage) *Cimicifuga elata* (BLM Tracking) *Euonymus occidentalis* (BLM Tracking) *Gymnocarpium dryopteris* (Lane County Sensitive)	**Lichens and Bryophytes** *Antitrichia curtipendula* 1 *Bryoria glabra* 2 *Bryoria friabilis* 2 *Cladonia bellidiflora 2* *Cladonia macilenta* 2 *Ichmadophila ericitorum* 2 *Lobaria oregana 3* *Lobaria pulmonaria* 3 *Lobaria scrobiculata* 3 *Nephroma helveticum* 3 *Nephroma laevigatum* 3 *Nephroma resupinatum* 3 *Pannaria saubinettii* 3 *Peltigera pacifica* 3 *Peltigera collina* 3 *Peltigera neckeri* 3 *Pilophorus acicularis* 2 *Ps. anthraspis* 3 *Ps. crocata* 3 *Pseudocyphellaria anomala* 3 *Sticta limbata* 3 *Sticta fuliginosa* 3 *Xylographa abietina* 2 **Vascular Plants** *Botrychium virginianum* (Eugene District Review) *Corallorrhiza trifida* (Lane County Sensitive)

	Localized and Rare	Widely Distributed and Rare or Localized and Common	Widely Distributed and Common
Supplemental and Broad	**None in planning area.**	**Amphibians** Clouded Salamander Oregon Slender Salamander **Birds** N. Bald Eagle N. Spotted Owl Great Gray Owl N. Pygmy Owl N. Saw-whet Owl Peregrine Falcon **Bats** Fringed Myotis Hoary Bat **Lichens and Bryophytes** *Usnea scabrata* 2 **Vascular Plants - none**	**Birds** Mountain Quail **Bats** Big Brown Bat California Myotis Long-eared Myotis Long-eared Myotis Pacific Pallid Bat Silver-haired bat Purple Martin **Lichens and Bryophytes** *Alectoria sarmentosa* 2 *Bryoria capillaris* 2 *Bryoria pseudofuscescens* 2 *Usnea filipendula* 2 **Vascular Plants - none**

BLM Special Status Invertebrates are not included in this table due lack of sufficient biological or local information to analyze these species. See Table D-2.
Survey and Manage Invertebrates were not included in this table because they are not dependent on riparian habitats. See section 5.4.
Shaded cells represent species most benefitting from, and potentially affected by, riparian habitat management. These species are discussed in greatest detail in the main document under ACS Objectives**.**

Analysis of Species Associated with Riparian Reserves in the MMLA ;
Ecological Classification of Species for Preliminary Vulnerability Assessment
(Riparian Reserve Module)

Explanation of Categories Used in Table D-3

Population Ecology – Describes the ecological roles played by Riparian Reserve habitats and the categories of habitats required for each of these roles.

Source Habitat – Riparian Reserves provide habitats that allow for survival and reproduction at a level that can contribute to survival of populations.

Exclusive Source – Source habitat for population persistence of the species occurs exclusively or nearly exclusively within Riparian Reserves.

Supplemental Source – Source habitat for the species occurs primarily in upland sites or other allocations such as LSRs, but is augmented by habitats in Riparian Reserves.

Dispersal Habitat – An ecological role of habitats within Riparian Reserves is to support movements by individuals of a species. This can include both permanent or periodic movements by individuals of any age class.

Restricted Dispersal – Individuals of a species have either inherently low mobility, or their movements can be hindered by clearings, roads, or other landscape features.

Broad Dispersal – Individuals of a species have inherently high mobility, and their movements are not hindered by clearings, roads, or other landscape features.

Geographic Distribution – Describes if the species is relatively localized in distribution or widely distributed over the area covered by the NFP.

Distribution

Localized – These species occur over a relatively small portion of the NFP. Species that are restricted in distribution to a physiographic province or smaller areas may be considered localized.

Widely Distributed – These species occur over a large portion of the area covered by the NFP. Species that occur in multiple physiographic provinces may be considered widely distributed, even if endemic to the Pacific Northwest region.

Abundance

Rare – Species that are generally found in relatively low numbers are considered rare. Species occurring in small numbers fall into this category.

Common – Species that can often be found in large numbers may fall into this category.

Table D-4 – Analysis of Wildlife Species and Vascular Plants Associated with Riparian Reserves in the MMLA : Species Ecological Classification.

SPECIES	Late - Succes-sional	Riparian Zone Terrestrial	Aquatic - Lotic	Aquatic - Lentic	Seeps, Springs	Rock Outcrops	Other Special Habitats	Comments
AMPHIBIANS								
Cascade torrent salamander		X	X		X	X		Although not obligated, benefits from late seral forests / characteristcs.
Dunn's salamander	X	X				X		Although not obligated, benefits from late seral forests / characteristics
Red-legged frog		X		X				Lotic for breeding. Uses terrestrial habitats near all aquatic habitats.
Tailed frog		X	X		X			Although not obligated, benefits from late seral forests / characteristcs. Requires terrestrial habitats.
Cascades frog		X	X					Unlikely to occur in planning area.
Western pond turtle		X		X				Dependent on undisturbed sunny ponds & slow water for breeding and nearby terrestrial habitats for egg laying.
BIRDS								
Harlequin duck	X	X	X	X				Although not obligated, benefits from late seral forests/characteristics.
MAMMALS								
White-footed vole		X						
VASCULAR PLANTS								
Botrychium montanum							X Cedar Swamps ; Bogs	
Botrychium minganense							X Cedar Swamps / Wet Meadows	
Romanzoffia thompsonii					X	X		

Table D-4 – Analysis of Wildlife Species and Vascular Plants Associated with Riparian Reserves in the MMLA : Species Ecological Classification.								
SPECIES	**Late - Succes-sional**	**Riparian Zone Terrestrial**	**Aquatic - Lotic**	**Aquatic - Lentic**	**Seeps, Springs**	**Rock Outcrops**	**Other Special Habitats**	**Comments**
Asplenium trichomanes ssp. trichomanes						X		
****Mimulus cardinalis***		X						
****Epipactus gigantea***		X						
Carex gynodynama							X Wet Meadows	
Carex arcta							X Bogs	
Epilobium luteum						X	X Wet Meadows	
Carex mendocinensis							X Wet Meadows	

- Only species associated with riverine systems will be evaluated under ACS. Other species are associated with Special Habitats and will be protected and managed under Inclusions.

Appendix E
ACEC Relevant and Important Factors

The following table outlines relevant and important factors that were identified as valid under the Proposed ACEC screening process. The text was taken directly from the ACEC screening results in 1994. Additional or clarifying information may be found in *italics* in this table or in the discussion and evaluation of these factors in section 5.6.

Key Issues	Relevance	Importance
1. South Bank Scenery	The Proposed ACEC is part of an 11-mile stretch of the McKenzie River that is eligible and suitable for Wild and Scenic River Designation. Scenic resources have been identified as one of the Outstanding Remarkable Values in this 11-mile stretch of river.	Although only a portion of the Proposed ACEC is within the Proposed Wild and Scenic Designation, the area outside the Proposed Designation but still within the Proposed ACEC is equal in scenic quality and is considered to have more than local significance.
2. Large Blocks of Low Elevation Land	**Riparian Community** – The riparian system over the length of Bear Creek, Rough Creek, and lower Marten Creek exhibit the following: 1) unfragmented riparian systems; 2) riparian communities in a mature seral stage; 3) stream channels in good condition; 4) water quality in excellent condition for fish and other beneficial uses; 5) invertebrate communities in unusually good condition.	**Riparian Community** – The area exhibits largely unfragmented riparian communities in excellent condition that contribute to excellent water quality.
	Vegetation – BLM portion of Marten Creek Watershed is predominantly uniform, even-aged older forest with pockets of old growth and/or residual old growth structural components. Along the streams are remnants of older forest. The area also serves the following: 1) wildlife diversity for species using lower elevation forests and; 2) linkages to higher elevation USFS lands to support plant, animal, fungal, and microorganism communities and to allow unique biological, genetic, and energy flows from low to high elevations.	**Vegetation** – Marten Creek exhibits relatively undisturbed forest stands in mature even-aged with some scattered old growth stands that are unique on the District.

Key Issues	Relevance	Importance
		Ecosystem – Most of the Proposed ACEC is under 2,000 feet in elevation with a range of 1,200 to 2,800 feet. There are few minimally disturbed blocks of public land under 2,000 feet on the east side of the Willamette Valley.
3. Fish Resources - Known or suspected within the Proposed ACEC	**Bull Trout** – The area is within the historic range of the McKenzie River Bull Trout population. **Cutthroat Trout** – Bear Creek contains isolated populations of cutthroat trout. ***Resident Salmonids*** *– Bear Creek contains a genetically isolated population of cutthroat trout. Bear, Marten, and Deer creeks provide spawning and rearing habitat for native cutthroat and rainbow trout.* **Anadromous Salmonids** – Steelhead utilize both Bear and Marten creeks; Chinook salmon have used Marten Creek; both streams are spawning habitat by native cutthroat trout.	**Bull Trout** – Past management practices have placed an emphasis on managing probable or potential habitat areas. *Bull trout were listed in 1999 as a Federally-listed Threatened species.* **Cutthroat Trout** – The isolated populations of cutthroat trout are sensitive to adverse change. ***Resident salmonids –*** The isolated population of cutthroat trout is *managed to maintain its genetic uniqueness. Both the resident cutthroat and rainbow trout are considered to be sensitive species.* ***Spring Chinook*** *– Spring chinook were listed in 2000 as a Federally-listed Threatened species.*
4. Wildlife Resources – known or suspected within the Proposed ACEC		**Wildlife Diversity** – The Proposed ACEC area and the adjacent Mt. Hagan Roadless Area (*Mt. Hagen LSR*) are important in preventing fragmentation of habitat important for wildlife species dependent on large intact forest environments such as pine marten and tailed frogs.
	Northern Spotted Owl - Documented – Bear Creek was an owl Habitat Conservation Area (HCA) and 3 pairs and one single owl, equaling 4 site centers, existed within the area of the original ACEC nomination. *HCAs are no longer a management designation for spotted owls. As of November 2000, there are 3 established pair sites with NFP unmapped–LSR cores on BLM land within the original AMA nomination and at least 4 known sites (on private and BLM land) within 1 mile of the ACEC boundary.*	

Key Issues	Relevance	Importance
	Tailed Frog – Documented – Bear and Marten creeks have viable populations of tailed frogs. Tailed frogs forage from the riparian zone to the ridge top. *At the time of writing, tailed frogs are known to exist in Bear, Rough, Marten and Deer creeks and their tributaries.*	**Tailed Frogs** – The presence of tailed frogs provides a unique opportunity to measure effects of disturbance because Bear and Marten Creek Watersheds are in the center of this species' distribution and range. This species can be vulnerable to adverse change and is found in drainages that are minimally disturbed. Timber harvest and road building have been detrimental in some areas for this species. *These drainages provide habitat for the largest known populations on the Eugene District.*
	Cascade Torrent (formerly Olympic) Salamander - Documented – The salamanders have been found on Hatchery and Marten creeks. They require cold, clear trickles of stable perennial 1st order streams in the transient snow pack zone *(roughly 1,000–3,000 feet in the local area)*. Buffered 1st order streams are thought to be critical for this species. *This species has also been located on Deer , N. Gate, and Rough creeks*	
	Oregon Slender Salamander – Suspected – Species only occurs in mature fir and old growth forests. Species utilizes fallen trees and bark from snags. Logging exposes the forest floor, creating unsuitable dry conditions.	
	Northern Red-Legged Frog –Documented – Species occurs in ponds and low-gradient streams; adults utilize uplands. Overstory vegetation and rodent burrows provide suitable damp places. Logging exposes the forest floor creating unsuitable dry conditions. *This species has been located in scattered locations within the planning area, with many being outside of the proposed ACEC boundaries.*	

Key Issues	Relevance	Importance
	Northern Saw-Whet Owl - Documented – The owl can be found primarily in young, mature, and old growth seral stages in coniferous forest. Snags must be present; forest conversion into grass/shrub-seedling series does not support this species. Species is not supported in large areas of uniform stands. Benefits from retention of all vegetation and snags in the riparian zones.	
	Northern Pygmy Owl -Documented Species habitat not entirely known, but has been recorded in numerous types and age classes in Oregon. Species utilizes tree cavities created by woodpeckers that in turn are dependent on a supply of large diameter decaying trees. Conversion of mixed-age forest stands to young trees is expected to be detrimental.	
	Mountain quail – Documented – Species believed to forage in early seral stages and use conifer stands for cover, including mature and old growth.	
	Harlequin Duck – Documented – Nesting habitat variable. Species does not tolerate destruction of riparian areas along streams, watershed stability, alterations in stream flow, mining, roads, timber harvest, or recreational disturbance in breeding areas. *A suspected breeding pair was located in Marten Creek in 1997.*	
	White-footed vole – Suspected – Species found in a variety of forest conditions including logged, burned, and mature coniferous forest – habitat information lacking.	

Key Issues	Relevance	Importance
	Pacific fisher – Possible – Species requires dense, mature, and old growth forest stands are believed to constitute optimum habitat, although study results vary by region. Species known to use second growth and even clear cuts after cover is established. Timber harvest is not considered compatible with maintenance of maximum fisher numbers in most areas, resulting in isolated habitat areas that are too small to sustain viable populations.	
	Pine Marten – Possible – Pine martens have been detected on nearby USFS land. The species utilizes mature mixed conifer forests and avoids areas without overhead cover while using the edges for forage. Limited logging in mature forest does not harm marten populations if clear cuts are small and ground cover becomes established quickly.	

Appendix F
Coarse Woody Debris
(Snags, Down Logs, and In-Stream Large Woody Debris)

1.0 Coarse Woody Debris (Snags and Down Logs)

Standing and down dead woody materials are essential components in coniferous forests of the Pacific Northwest. They provide numerous processes and functions including nutrient cycling, carbon stores, and habitat for a myriad of vertebrate, invertebrate, and plant species (Brown 1985, and Bull et al. 1997). Specific mortality agents such as fire, disease, insects, natural suppression, and wind refer to the diverse range of size and decay classes of Coarse Woody Debris (CWD) present in a forest at any given time. CWD takes on many forms in forested ecosystems and may be present as either snags (standing dead trees) or down logs (above or below ground). Levels of CWD accumulation after natural disturbance, such as fire, typically are much greater than levels present after a timber harvest or pre-commercial thin (Spies et al. 1988). Larger and more decayed snags and logs are generally a limiting factor in many managed forests. Managing for levels of CWD more similar to those present under natural disturbance regimes would provide for greater diversity, abundance, and survival of biotic organisms and abiotic processes dependent upon these features.

The Northwest Forest Plan (NFP) provides specific direction to address CWD and develop management recommendations based on additional information and local conditions (NFP ROD pg. C-40). An objective of this Landscape Design is to maintain and/or create CWD quality and quantity more closely resembling those found in natural forests as compared to the interim levels described in the NFP.

The amount of carryover and recruitment of CWD that occurs during natural succession is not realized in many managed forest regimes. Historic clear cut harvest and broadcast burning treatments removed most potential carryover wood that would be found in naturally regenerated stands that followed natural disturbances. Harvest and thinning operations often damage or destroy existing snags and down wood and salvage practices remove much of the wood that would be present from natural disturbance mortality. Pre-commercial and commercial thinning events minimize the number of trees that would die from suppression mortality in the later stages of forest development. To manage for quality and quantity of CWD more closely resembling that typical in natural stands it will be necessary to periodically maintain and create dead wood throughout the development of forest stands managed for wood products. CWD will be managed according to the western hemlock plant series which is 93 percent of the federal lands in the planning area. The Douglas-fir series is represented in most of the remaining 7 percent of the federal lands.

1.1 Snags

Snags are an important structural component in forest communities and many wildlife species depend on them for survival. They are used for a variety of functions such as nesting, foraging, perching, and roosting. Of the nearly 100 species of wildlife that use snags, over half are dependent on cavities for at least 1 of 18 life cycle needs, at least 4 that relate to nesting (Thomas et al. 1979, Nietro et al. 1985 in Brown Chapter 7). Examples of cavity-nesters that may occur in the Bear Mt. AMA include pileated, hairy, and downy woodpeckers (primary cavity nesters), brown creepers, red-breasted nuthatches, American martens, northern flying squirrels, and several owl species (secondary cavity-nesters). Examples of non-cavity-nesting wildlife that potentially occur in this region and that are dependent on snags for some part of their life cycle include up to 15 bat species. Most species require specific ranges of snag diameter, height, and decay. Thus it is important to maintain and/or create a diversity of snag types in a managed landscape. In addition to vertebrate wildlife habitat, snags provide essential habitat for many invertebrates and a suitable growing environment for many species of fungi, epiphytic mosses,[1]

and lichens.

1.1.2 Existing Conditions of Snags

Little data have been collected on existing conditions of CWD in the planning area. The immediate and future availability of snags depends on their current size and stage of decay (Neitro et al. 1985). Data collected within northern spotted owl home ranges is shown in **Table F-1.** These indicate that the majority of the snags existing within the AMA Bear Marten Watershed are less than 15 inches in diameter, which is below the minimum of 16–20 in diameters required by most species of primary cavity-nesting birds and mammals.

Of the three age classes depicted, 80-119 year stands had the greatest number of snags ≥ 15" dbh (11/acre). Past salvage activities in older stands and harvest in younger stands, as well as differences in fire history, may account for the low densities of large snags in these age classes. Stage of decay of snags >15" were predominantly class 2 and 3 (as described by Cline, 1980). Snags of later stage of decay are used by more species than snags in early stages of decay. Sound snags are immediately available to fewer species.

Table F-1 – Existing Snags within the AMA

Average snag densities for 3 age and size classes estimated from data collected on 277 snags within home range of northern spotted owls in the Bear Marten Watershed within the AMA. Average decay of measured snags is class 2 and 3 (Irwin et al. from Bear/Marten Watershed, McKenzie Resource Area, 1998).

Age Classes (years)	Size Class (inches)	# Snags/ size class	Avg. DBH (inches)	Avg. Ht. (feet)	Avg. Densities (approx. #/acre)	Average # of Snags > 16 inch diameter (all decay classes)
< 80	≤ 15	46	7.1	37.9	51	
(managed)	16-19	1	16.1	6.5	1	
	≥20	**7**	**23.2**	**19.7**	**2**	**3**
	≤ 15	95	8.6	41.4	40	
80-119	16-19	15	16.4	38.1	5	
(unmanaged)	**≥20**	**66**	**30.7**	**30**	**6**	**11**
	≤ 15	37	7.7	37.1	41	
≥ 120	16-19	0	0	0	0	
(unmanaged)	**≥20**	**10**	**31.3**	**52.8**	**2.5**	**2.5**

Snag Conditions for Forests Similar to the Planning Area – The three data sets shown in **Table F-2** are from studies within and near the planning area that include information on large (> 16 inch), decay class 1-3 snags and represent the average number of snags in four age classes. The average level of snags in stands between 20 and 150 years is 9.8 (8.1–13.2) snags/acre.

Table F-3 shows composites of data for large diameter (> 16 inch), decay class 1-2 snags included in Table F-2 plus data from other western Oregon habitats similar to those in the planning area. The average level of snags in stands between 20 and 150 years is 8.5 (8.1– 8.8) snags/acre.

Table F-2 – SNAGS - Data Sets in or Near the Middle McKenzie AMA

		Early (~ 21-50 yrs.)	Early - mid (~ 21-79 yrs.)	Mature (~ 80 - 150 yrs.)	Old Growth (~ > 150 yrs.)	Reference # and Comments

Series	Size Class (Diam in Inches Length in Feet)	Avg Decay Class (1 - 5)	Avg. Density (# / Acre)	Avg Density Total (# / Acre (> 16 in Diam)	Avg Decay Class (1 - 5)	Avg. Density (# / Acre)	Avg Density Total (# / Acre (> 16 in Diam	Avg Decay Class (1 - 5)	Avg. Density (# / Acre)	Avg Density Total (# / Acre (> 16 in Diam	Avg Decay Class (1 - 5)	Avg. Density (# / Acre)	Avg Density Total (# / Acre (> 16 in Diam	
PSME TSHE	16-19 in	2-3	1.1					2-3	5.4		2-3	0		1 early = 25 - 79 yrs mature = 80 - 119 og = 120+
	≥ 20 in	2-3	2.0	**3.1**				2-3	5.8	**11**	2-3	2.5	**2.5**	
PSME	≥ 16 in	1-3		**13.2**	1-3		**13.2**	1-3		**8.3**	1-3		**11.4**	2 early = 25 - 79 yrs mature = 80 - 119 og = 120+
TSHE	≥ 20 in ≥ 20 ft									**3** (0-5)			**12** (11-21)	3 ( ) = 25 & 75 % quartile ranges
PSME	≥ 20 in ≥ 20 ft									**10** (11-21)			**23** (13-42)	
Average # of Snags/Acre > ~ 19 in. diam in decay class 1-2				**8.2**			**13.2**			**8.1**			**12.2**	

1 Irwin et al. 1998 (NCASI) in the Bear Marten WA, p 4-67. Includes data collected in test and random vegetation plots within the home ranges of spotted owls, and in random plots throughout the Bear Marten AMA. Amounts are higher when the entire data set is included (reference # 2). Most data were in unmanaged stands that experienced a high-severity fire approx. 90 years ago. Most remnant snags created from the fire event had decayed at time of study.

2 Irwin et al. 1998 (NCASI) . Data collected in test and random vegetation plots within the home range of spotted owls and random plots throughout the Bear Marten AMA plus Fall Creek and Mohawk watersheds. Includes some managed stands.

3 Mid-Willamette LSR Assessment, 1998, Appendix F, pages 20 and Chapter 2, page 30. Data from CVS plots are in existing stands. Data was transformed. Data were pre and post stratified (for inclusion in the LSR Assessment) based on if the random CVS plot was determined to be representative of the series for that stand.

Table F-3 - Snag Data Summary (Includes data in Table F-2)
Most data are for decay class 1-2 for large snags in Oregon, west slope of the Cascade Ranges in habitats similar to those in the AMA planning area. All data are for plant series Douglas-fir and/or western hemlock unless noted. Some data sets were transformed to estimate size and decay class criteria and are estimates only. No data are included for stands less than 20 years after a major disturbance event.

		Average Densities – # > 19 in. diam. snags/acre			Reference
Series	**Size Class diam = in. length = ft.**	**Early (~ 20–60 years)**	**Mature (~ 80–150 years)**	**Old Growth (~ > 150 years)**	
	> 20 in.	10 (< 80 yrs)			Spies et al. 1988
	> 20 in.		7.9 (> 70 yrs)		Hemstrom and Logan 1987
	> 20 in.		15 (> 70 yrs)		South Cascades LSR Assessment 1998, Ecology Plots
	16 -19 and > 20 in.			7 (> 200 yrs)	South Cascades LSR Assessment 1998, Ecology Plots
	> 20 in.		6 (80 - 200 yrs)		Spies et al. 1988
	> 17 in.		4.4 avg. 117 yrs)		Ohman et al. 1994, western Oregon and Washington.
	> 20 in.			10 (> 200 yrs)	Spies et al. 1988
	> 20 in.			4.8 (> 200 yrs)	Little River WA, 1995
	> 17 in.			13.7	Ohman et al. 1994, western Oregon & Washington.
western OR, WA conifer/ mixed hdwd			7.2	12.7	*Wildlife Habitat Relationships in Oregon.* (in prep, Ch. 24)
PSME TSHE	≥ 16 in.	3.1	11	2.5	Irwin et al. 1998 from Bear Marten WA AMA data only.
PSME	≥ 16 in.	13.2	8.3	11.4	Irwin et al 1998 McKenzie & Mohawk watershed data.
TSHE	≥ 20 in. ≥ 20 ft.		3	12	Mid Willamette LSR Assessment 1998
PSME	≥ 20 in. ≥ 20 ft		10	23	Mid Willamette LSR Assessment 1998
Average # Large Snags/Acre > ~ 19 inch in decay class 1-2		**8.8**	**8.1**	**10.8**	*See main reference page for references*.

1.1.3Snag Management

1.1.3.1 Introduction

Developing recommendations for snag amounts through analyses of data are subject to the inherent variability within the data and the natural variability found at any location within a forest stand at a given time based on stand disturbance history, plant series, conifer size, moisture, topographic position, and stand age. The volume of all coarse wood (snags and down logs) typically present the first three decades after a major disturbance is significantly higher than amounts to be managed for after harvest due to operational feasibility, fuel fire concerns, and the objective to remove wood products. Much of this volume is composed of small length or diameter pieces that are less limiting to wildlife and most easily recruited through natural processes. Management will focus on maintaining/creating diameter and lengths in lower decay classes that are more important to biotic and abiotic processes and also less likely to be naturally recruited in managed stands.

The prescribed snag level requirements attempt to approximate the quality and amount within the natural variation that would be expected to occur within the planning area while considering constraints such as those mentioned above.

1.1.3.2 General Objectives

Snag creation and retention will be managed at each regeneration or commercial thinning entry occurring roughly between stand ages 30–100 years in Landscape Area 1 and 30–180 years in Landscape Area 2. The main objective is to manage for a consistent supply of large, hard snags throughout the life of the stand that is closer to levels expected to occur in natural stands of the western hemlock plant series on the west slope of the Cascade Range in Lane County. Large and hard snags are defined as those > 16 and 20 inches in diameters in decay class 1-2.

Snags in older decay classes or those known to be important to local plant, fungal, or wildlife populations will also be managed for based on project ID Team considerations.

Management recommendations for stand entries for restoration or as a result of unplanned disturbances (such as fire, major windthrow, etc.) and additional recommendations for riparian zones will be developed later.

1.1.3.3 Specific Snag Objectives

- Maintain and create snags throughout the stand rotation to more closely mimic quality and amounts typical in western hemlock series forests on the western slope of the Cascade Range.
- Maintain and create snags with a diversity of heights, diameters, and stages of decay with a focus on large diameter sound snags.
- Distribute snags throughout the landscape in patterns representative of a mixed-severity fire regime (combination of aggregates and individual dispersed snags). Snag density and distribution should emulate natural patterns seen in different topographic slope positions (i.e., after regeneration harvest, create/retain more snags in upslope positions). These considerations should be balanced with factors such as safety and operational limitations and the realization that snags in downslope positions may remain standing longer or be more usable for some wildlife and plant/fungal species.
- Leave enough snags and green trees in patches so that at any given time there will be some live trees and some snags within the landscape block. Multiple live tree/snag patches maximize the functionality of the area for foraging and nesting areas as well as microclimate.
- Provide nesting, foraging, roosting, and refugia habitat for cavity-nesting birds, and for bat, mammal, amphibian, and invertebrate species throughout the stand rotation.
- Provide host substrate for vascular and non-vascular plant species throughout the stand rotation.

1.1.3.4 Management Guidelines (Table F-4) Management guidelines are specified for 3 potential treatment types: regeneration harvest, pre-commercial, and commercial thinning. Snags will be described as:

- "sound" (i.e., hard) refers to early stages of decay in decay class 1-3 and;
- "decayed" (i.e., soft) refers to later stages of decay in decay class 4-5 as described by Cline 1980.

The number of prescribed large sound snags was generated from data gathered in natural stands similar to those in the planning area (Table F-3). Snag levels prescribed are for age classes where harvest treatments are expected to occur. Details on attaining the snag requirements are described following the table.

Table 3-7 (= Table F-4 in Appendix F)
Snag Requirements and Specifications by Treatment Type and Age Class

Harvest Treatment	Snag Requirements	Snag Creation/Retention Specifications	Retention and Creation Methods For Harvest Areas (See creation methods in Appendix F)
Regeneration (any age)	≥ 8 /acre	All ≥ 50 ft tall All ≥ 16"dbh 50 % ≥ 20" dbh 50 % ≤ Decay class 1-2	Retain all existing decayed and sound snags to the extent possible. Create snags if retention levels are below Snag Requirement levels. *If stand must stabilize after regen, create at least half of the snags at regen and remaining snags within 10 - 15 yrs..*
Precommercial Thinning - A (15 - 35 yrs) ***For stands with previous harvest implemented PRIOR TO MMLD***	Depends on availability and needs.	None	Retain all existing decayed and sound snags. Create snags from existing overstory/leave trees if possible, based on availability.
Precommercial Thinning - A (15 - 35 yrs) ***For stands with previous harvest implemented UNDER MMLD***	≥ 8/acre	None (unless creation treatments not yet completed from regen)	Retain all existing decayed and sound snags. Any remaining green trees dedicated for snag creation at time of regeneration harvest not yet treated should be treated before or during this entry.
Commercial Thinnings (30 - 80 years in LA 1 30 -110 years in LA 2)	≥ 8/acre	Stands < 80 yrs: All ≥50 ft tall All ≥ 16 " dbh 50% ≥ 18-20 " dbh (if available) 50 % ≤ Decay class 1-2 Stands ≥ 80 yrs: ≥ 70 ft. tall All ≥ 16"dbh 50 % ≥ 20" dbh 50 % < Decay class 1-2	Retain all existing decayed and sound snags to the extent possible. Create snags if retention levels are below Snag Requirement levels. If the stand does not contain enough live trees of the appropriate diameters, create "living snags".

1.1.3.5 Attaining Snag Requirements (Table F-4)

Snag Requirements

The prescribed levels can be met by retention and/or creation of snags in all harvest treatments. Only conifer species count towards snag requirements. Snag quality generally increases with increased diameters and heights.

All created/maintained logs should be conifer species ≥ 20 in. diameter at breast height , and ≥ 50 foot length, and ≥ 50% must be sound (decay class 1 or 2).

Snag Retention

- Retain all existing decayed and sound snags in the harvest unit to the extent possible.
- Prioritize the retention of larger snags (all decay classes) and snag aggregates.
- For existing sound snags to count towards the required levels, they must meet the size specifications and be protected during harvest activities. If damaged during harvest activities, these should be replaced by creating new snags *(Damaged is defined as diameter or length reduced below minimum requirements).*

Snag Creation

- If new snags are necessary to meet specification levels, create sound snags after harvest. For commercial thinning harvests, snags should be created within 10 years after harvest. For regeneration harvests, some snags will be created after harvest and some after the stand has stabilized. Snags should be created within 10 years after harvest.

- Ground girdling is the quickest and least expensive method to create snags from live trees but often results in snags that remain standing and usable for less time. Where feasible, some snags should be created by the following methods:
  --Top live trees at heights greater than 50 feet by chainsaw or blasting.
  -- Low girdling is most appropriate only at the time of the last commercial thinning entry or within riparian reserves to minimize safety hazards and should be implemented above 25 feet where possible.
  -- "Living snags" may be created by topping live trees and retaining a minimum of nine live limbs (from the top of the crown).
  -- Innoculants should be considered to increase the rate of decay in created snags.

  - Attempt to create snags at a variety of heights to mimic natural diversity.
  - Retain dead and dying limbs where possible to provide perching and resting sites for cavity-nesters.
  - Do not create snags exclusively from overstory remnant (legacy) trees.
  - Mark all created snags with permanent wildlife signs and map for future monitoring and harvest retention.

Snag Distribution

- Where possible, clump some green trees around areas with high creation/retention snag densities to reduce the chance they will pose a safety hazard or be damaged during harvest.
- When possible, aggregate snags in clumps of 5–10+ snags over 25-50% of the area to be harvested. Disperse the remainder of the snags throughout the harvest unit.
- Where possible and consistent with other resource concerns, to increase efficiency of operational procedures, and to protect clumps from mechanical damage, maintain these aggregates within green tree retention areas or other reserves.
- Create some of the aggregates on ridge-tops for bat habitat. Where possible, sound snags should be topped in these exposed areas to reduce the chance of windthrow.
- Consider the expected needs of existing populations of wildlife, plant, and fungal species in or near a harvest. Provide for minimal disturbance to snag habitats while maximizing down log habitat retention and creation.

Future Snag Recruitment

Snag recruitment will occur naturally through the life of a stand. This was considered when developing the target levels for creation/retention. Remaining green trees not used for snag creation may contribute to future snags and/or down wood, but no specific amounts for future recruitment are recommended.

Riparian Reserves – Management activities within Riparian Reserves will meet the Aquatic Conservation Strategy Objectives. Recommended levels of snags will be determined based on local site conditions and further recommendations may be developed as needed (see Table 3-9: *Stream Side*

Management Prescriptions for Harvest, GTR, CWD and LWD in sec 3.4.4).

1.2 Down Logs

Down logs are an important functional component of both terrestrial and aquatic forest ecosystems. They reduce erosion, affect soil development, intercept and stabilize water in upslope habitats, are a major source of energy and nutrients, serve as a seedbed for vascular plants and surface for lichens and bryophytes, and provide habitat for a broad array of organisms - including microbes, plants, invertebrates, and vertebrates (Harmon et al. 1986 and Maser and Trappe 1984). Down logs provide habitat for insects and fungi that, in turn, provide food for many species of birds, mammals, reptiles, amphibians, and fish. Logs also provide shelter, protective cover, nesting sites, travel corridors, and thermal protection for a variety of wildlife species; for example, large hollow logs provide potential den sites for martens, bears, and other carnivores and smaller logs provide hiding cover and travel corridors for small mammal species such as red-backed voles and for amphibian species such as clouded salamanders. In addition, large logs provide habitat complexity and cover within streams for many fish species. In-channel large woody debris regulates channel processes by slowing water flow, decreasing width-to-depth ratio, enabling flood plain connection/side channel development, and creates habitat for fish and other aquatic dependent species.

The distribution and orientation of logs influence use by wildlife and plant species (Harmon et al. 1986 and Bull et al. 1987). Under a natural disturbance regime, logs are unevenly distributed across the forest (Spies and Cline 1988) and both aggregates and single logs may be found. Wood is often present in clumps as a result of small disturbance events such as insect infestation, root pathogens, blowdown patches, or patchy fire. Additionally, the large overstory trees that contribute heavily to the dead wood supply are irregularly distributed (Harmon 1986). In relatively continuous forested stands that developed from a hot fire, wood may be distributed more evenly. Both patterns of distribution are beneficial to forested ecosystems. Even distribution of wood provides spatial and temporal continuity of habitat that may be important to the survival and migration of invertebrate and small vertebrate species. Log aggregates may provide refugia or nesting sites for wildlife and suitable microclimate for plant germination. Logs that lie on the contours of a slope may be used more by wildlife than logs oriented across contours especially on steep slopes. Soil and organic debris that accumulate along the upslope side of a log encourage seedlings to establish and grow and, in turn, provide a more diverse habitat for both invertebrates and small vertebrates to inhabit (Maser and Trappe 1984).

1.2.1Existing Conditions of Down Logs

Little data have been collected on existing conditions of CWD in the planning area. Log data were recorded by age and size class within spotted owl home ranges in the Bear Marten Watershed within the AMA planning area (**Table F-5**). The majority of the logs were smaller than 20” in diameter. These logs were probably added to the stand by suppression mortality. The greatest quantity of wood was in the 80-120 year stands. The average linear feet per acre of logs > 20” in diameter in this age class was 414 with an average decay class of 3.4. It can be interpreted from these data that many of the larger logs were recruited from the previous stand. In stands > 120 yrs, average linear feet per acre was 161 with the majority of the logs being in late stages of decay. These logs will not persist throughout the rotation period of the stand; thus it will be necessary to create a source of new CWD when older stands are entered so that future CWD will be available. Lowest quantities of wood were seen in stands < 80 years; the average linear feet/acre for logs > 20” diameter was 122. These quantities appear low when compared to numbers typically found in similar naturally regenerated stands of this age class (Table F-7). The average for stands less than 120 years was 268 (122–414).

Table F-5– Existing Log Data Within the AMA

(Average log measurements for 3 age classes and 2 size classes estimated from data collected within home ranges of Northern Spotted Owls in the Bear Marten Watershed, within the AMA (1998). Stands greater than 80 years are naturally regenerated.)

Age Classes (yrs)	Size Class (in.)	# Logs tallied/ size class	Avg. small diam (in.)	Avg. large diam (in.)	Avg. Length	Avg. Decay Classes[A]	Linear Feet per Acre[B]	Linear Feet / Acre of large logs[B]
< 80	< 20	124	5.8	7.8	21.5	2.4	1,565	
< 80	≥20	7	20.8	24.7	29.5	3.4	122	**122**
80-119	< 20	682	8.3	10.2	19.9	2.9	2,384	
80-119	≥20	73	23.1	31.2	32.4	3.4	414	**414**
≥ 120	< 20	144	8.1	9.6	15.7	3.7	1,130	
≥ 120	≥20	18	25.6	29.1	17.8	4.4	161	**161**

[A] Decay class 1 - 3 are in early stage of decay (sound) and decay class 4 - 5 are highly decayed (soft). Hard and soft as defined by Fogel et al. 1973 and Sollins 1982.

[B] Linear feet extrapolated from log volume.

The data shown in **Table F-6** are from studies within a nearby planning area and includes reported or transformed data for large (> 19 inch diameter) sound (decay class 1-2) logs. The average linear feet/ acre of large sound logs for stands between 21–150 years was 319 (312–366).

Table F -6 : DOWN WOOD - Data Sets In or Near the BLM AMA Planning Area (Lf = linear feet)							
			Early	Early-Mid	Mature	Old Growth	Reference # and Comments
Series	**Size Class (Diam in Inches**	**Avg Decay Class (1 - 5)**	**Avg Density (Lf/Acre)**	**Avg. Density (Lf/ Acre)**	**Avg. Density (Lf/Acre)**	**Avg. Density (Lf/Acre)**	
TSHE, PSME	> 19.7 in	2-3		**121**	**414**	**161**	1 early - mid = 24 - 79 yrs mature = 80-119 yrs og = 120+ yrs
TSHE, PSME	> 19.7 in	est. 1-2	**354**	**411**	**375**	**479**	2 early = 24 - 59 yrs, mid = 60- 79 yrs, mature = 80-119 yrs, og=120+ yrs dc 1-2 estimated from total x 0.29 [A]
TSHE	> 21 in				**190**	**159**	3 dc 1-2 reported in data set #s are lower since > 21 in. used
TSHE, PSME	est. > 20in	est. 1-2		**405**			4 405 = estimated amount of total down wood that was > 20 in diam and in dc 1 - 2. Calculated from total x 0.65 x 0.29 [A]
Average Linear Feet of *large logs > 19.7 inch in decay class 1-2* .				**312**	**326**	**266**	

References and Footnote.

1 Irwin et al. 1998 (NCASI) Eugene BLM from Bear Marten WA, p 4-67. Data collected in test and random **vegetation plots** within the home range of spotted owls and random plots throughout the **Bear Marten AMA**. Includes only plots within the AMA planning area. Amounts are higher when entire data set is included (reference # 2). Many were in unmanaged stands that experienced a high-severity fire approx. 90 years ago.

2 Irwin et al. 1998 (NCASI) Eugene BLM p27. Data collected in test and random **vegetation plots** within the home range of spotted owls and random plots throughout the **Bear Marten AMA plus Fall Creek and Mohawk watersheds.** Includes some managed stands.

3 Mid-Willamette LSR Assessment Appendix F, p 20, and Chapter 2, p 30. Data from **CVS plots** (log transformed data) in existing stands. Data were pre and post stratified (for inclusion in the LSR Assessment) based on if the random CVS plot was determined to be representative of the series for that stand.

4 Butts, 1997. Study done on Weyerhaeuser and BLM lands west of I - 5. Approximately half of the **grids** were in/near the AMA planning area.

A Conversion factors from observations in Wright, P.J., 1997 data where approximately 29 % of log volume was in decay class 1-2 in a douglas fir / western hemlock mixed severity fire regime; and from Augusta Creek data (provided by Jane Kertis) where approximately 65 % of log diameter size was > 20 inches. These estimates are subject to variability but are assumed to be conservative.

Table F-7 shows composites of data for large (≥ 19 inch diameter) sound (decay class 1-2) logs in Table F-6 plus other studies in similar habitats, mostly in western Oregon. The average linear feet / acre of large sound logs for stands between 21 - 119 years was 392 (383-400)

Table F-7– Down Log Data Summary

Data for decay class 1 -2 large logs > 19 inch diameter at small end, in Oregon, west slope of the Cascade Range in habitats similar to those in the AMA planning area. All data is for plant series Douglas-fir and/or western hemlock unless noted. Some data sets were transformed to estimate size and decay class criteria and are estimates only. No data are included for stands immediately after a major disturbance event.

Average Densities: Linear Feet / acre of > 19 inch diameter logs in decay class 1 - 2			**Reference**
EARLY - MID (~ 25 - 69 yrs)	MATURE (~ 70 - 119 yrs)	OLD GROWTH (>~ 120 yrs)	
648	786	1136	*Wildlife Habitat Relationships in Oregon.* (in prep, Ch. 24)
406 (51-60 yrs)			Butts, 1997
336 (< 80 yrs)	438 (80-119 yrs)	375 (> 120 yrs)	Irwin et al. 1998 in Bear Marten, Mohawk, and Fall Creek watersheds.
	197 (80-200 yrs)	197 (80-200 yrs)	Spies et al. 1998
		428 (> 200 yrs)	Spies et al. 1998
121 (24-70 yrs)	414 (80-119 yrs)	161 ($\geq$ 120 yrs)	Irwin et al. 1998 in AMA
354 (24-59 yrs) 411 (60-79 yrs)	375 (80-119 yrs)	479 ($\geq$ 120 yrs)	Irwin et al. 1988 in McKenzie, Fall Creek. and Mohawk watersheds
	190	159	Willamette LSR Assessment. 1998 (CVS Data) (western hemlock series)
			Willamette LSR Assessment. 1998 (CVS Data) (Douglas-fir series)
405 (50-60 yrs)			Butts, 1997 BLM
383	**400**	**419**	**Average Linear Feet/Acre of Down Wood in Large Logs > 19 inch diameter in decay class 1-2.**

C. SIZE and DECAY CLASS: All log volumes were either reported in the size classifications shown or transformed from the reported volume and/or diameter to estimate amounts in a mixed intensity fire regime in the Douglas-fir series.

B. SERIES: All data sets are in Douglas-fir and/or western hemlock series forests, unless noted.

1.2.2 Down Wood Management

1.2.2.1 Introduction

Developing recommendations for down log amounts through analyses of data are subject to the inherent variability within the data and the natural variability found at any location within a forest stand at a given point in time based on stand disturbance history, plant series, conifer size, moisture, topographic position, and stand age. The volume of all coarse wood (snags and down logs) typically present the first three decades after a major disturbance is significantly higher than amounts to be managed for after harvest due to :

- operational feasibility

- fuel fire concerns
- the objective to remove wood products, and
- the assumption that stands will naturally recruit logs, even with disturbance from harvest entries.

Much of the volume in the first three decades is composed of small length or diameter pieces that are less limiting to wildlife and most easily recruited through natural processes. Management will focus on maintaining/creating larger diameter and length logs in lower decay classes that are more important to biotic and abiotic processes and also less likely to be naturally recruited in managed stands. Down logs in older decay classes or those known to be important to local plant, fungal, or wildlife populations will also be managed for based on project ID Team considerations.

The prescribed down log levels attempt to approximate the quality and amount within the natural variation that would be expected to occur within the planning area while considering constraints such as those mentioned above.

1.2.2.2. General Objectives

Snag creation and retention will be managed at each regeneration or commercial thinning entry occurring roughly between stand ages 30–100 years in Landscape Area 1 and 30–180 years in Landscape Area 2. The main objective is to manage for a consistent supply of large, sound logs throughout the life of the stand that is closer to levels expected to occur in natural stands of the western hemlock plant series on the west slope of the Cascade Range in Lane County. Large and sound logs are defined as those > 16 and 20 inch in diameter, > 20 feet long, in decay class 1-2. Snags in older decay classes or those known to be important to local plant, fungal, or wildlife populations will also be managed based on project ID Team considerations.

Management recommendations for stand entries for restoration or as a result of unplanned disturbances (such as fire, major windthrow, etc.) and additional recommendations for riparian zones will be developed later.

1.2.2.3 Specific Down Log Objectives

- Maintain and create logs throughout the stand rotation to more closely mimic the quality and amounts typical in western hemlock series forests on the western slope of the Cascade Range.
- Maintain and create down logs with a diversity of lengths, diameters, and stages of decay with a focus on large diameter, longer length, sound logs.
- Snag density and distribution should emulate natural patterns seen in different topographic slope positions (i.e., after regeneration harvest, create/retain more down logs in upslope positions).

- Create refugia and nesting habitat by maintaining or creating clumps of logs over part of the harvest area.
- Where possible, maintain or create dispersal corridors to ridge tops and riparian areas for small mammals and amphibians by connecting clumps of logs with evenly dispersed pieces.
- Attempt to provide adequate foraging, hiding, thermal cover, and nesting habitat for birds, mammals, amphibians, and invertebrates throughout the stand rotation.
- Provide seed beds for conifers and host substrate for vascular plants, fungi, and lichens.

1.2.2.4 Management Guidelines (Table F-8)

Management guidelines are specified for 3 potential treatment types: regeneration harvest, pre-commercial, and commercial thinning (Table F-8). Logs will be described as

- "sound" (early stage of decay in decay class 1-3) and
- "decayed" (late stages of decay in decay class 4-5) as described by Fogel (1973) and Maser et al. (1979). See Table F-10

Table 3 - 8 (= Table F-8 in Appendix F)
Down Wood Requirements and Specifications
by Harvest Treatment for a Mixed-severity Fire Regime in the MMLD

Harvest Treatment	Down Log Requirements [1] In Linear Feet/Acre	Down Log Specifications [2]	Retention and Creation Methods **Maintain all existing decayed and sound logs, ≥ 16 inch diameter, on the forest floor to the extent possible for all harvest treatments AND:**
Regeneration (any age)	300 lf / ac.	All created/retained logs that contribute to achieving 300 lf / ac should be : conifer species AND ≥ 20 in. diameter at small end and ≥ 20ft. length [2] AND > 50% must be sound (decay class 1 or 2) [2]	Retain and/or create down logs to meet the required amounts by falling trees that meet the specifications. *Create a minimum of 240 lf at regen (see exceptions in 3.4.3 section)* *If stand must stabilize after regen, create remaining logs within 10-15 yrs.*
Precommercial Thinning - A (15-35 yrs) ***For stands with previous harvest implemented PRIOR to MMLD***	300 lf / ac.		Retain and/or create down logs to meet the required amounts by falling existing trees that meet the specifications, if available and/or Maintain future reserve trees for the next commercial thinning.
Precommercial Thinning - B (15-35 yrs) ***For stands with previous harvest implemented UNdER MMLD***	NONE if target amounts created during regeneration harvest		Any remaining untreated green trees, dedicated for down logs at the time of the previous regeneration harvest, should be treated during this entry.
Commercial Thinnings (35 - 80 yrs in LA 1; 35 - 110 yrs in LA 2)	300 lf / ac.		Retain and/or create down logs to meet the required amounts by falling trees that meet the specifications. Used trees with diameters ≥ 16 inch and ≤ 20 inch only when trees ≥ 20 inch diameter are not available.

[1] See Table F-9 in Appendix F fFor # logs required based on d.b.h. to meet linear feet requirements.

[2] Exceptions to this requirements are permitted when doing so would be an advantage to local wildlife, or plant/fungal species. For example, creating or maintaining smaller down logs in an area known to be used by clouded salamanders or *Allotropa virgata.*

1.2.2.5 Attaining Down Log Requirements

Down log requirements can be achieved by applying one or both of the following methods:

(1) Maintain all existing down wood by protection during harvest activities.

Sound wood of the specified size will count towards requirements. Inventory and mapping of existing down logs should be implemented to track the volume, decay, and location of existing wood (if possible). Sampling methods could be developed and implemented during stand exams to complete these tasks.

Maintenance of existing logs would minimize the number of green-trees required for down log creation, minimize disturbance to existing habitats and wildlife, plant or fungal species and provide more variability in decay class. However, in some stands it will still be necessary to fall green-trees to meet the linear feet/acre log requirements.

(2) Create the required linear feet of down logs by falling green trees during and/or within 10 years after harvest activities.

It will be assumed that no down logs of the appropriate size are present and no pre-harvest inventory will be required. This method would increase the number of green trees that will be dedicated for coarse woody debris while decreasing or eliminating the amount of pre-harvest log sampling and marking.

Under both methods, additional wood will need to be added periodically during stand development because of the long rotation periods proposed in the Landscape Plan, and the knowledge of decay rates of down logs. Therefore, a method for tracking the input, presence, and maintenance of down logs throughout stand rotation should be developed. Incorporation of such a tracking system as part of the planning process will likely increase the efficiency of interdisciplinary teams and facilitate monitoring of down logs if desired.

Down Log Requirements

All created/maintained logs should be conifer species $\geq$ 20 in. diameter at small end, $\geq$ 20 ft. in length, and $\geq$ 50% must be sound (decay class 1 or 2) . See exceptions for local plant and wildlife concerns.

Log Distribution

Snag density and distribution should attempt to emulate natural patterns seen in different topographic slope positions (i.e., after regeneration harvest, create/retain more down logs in upslope positions). These considerations should be balanced with factors such as safety and operational limitations and the realization that down logs in downslope positions may be more usable in the future for some wildlife and plant/fungal species.

Specific distribution of down wood should be determined on a site-level basis by planning teams to accommodate local needs. General guidelines are:

- Distribute 50-75% of the logs evenly over the treatment units to maintain

continuity of wood on the forest floor.

- Clump the remaining 25-50% within the treatment units.
- Protect down logs from mechanical damage by creating log clumps within green tree retention areas and snag clusters.
- Consider the expected needs of existing populations of wildlife and plant/fungal species: provide for minimal disturbance while maximizing down log habitat retention and creation for these species. Local species concerns may warrant variations in these recommendations.

Down Log Retention and/or Creation

- Retain all existing decayed and sound logs, $\geq$ 16 inches diameter, on the forest floor to the extent possible.
- Only sound logs $\geq$ 20" DBH and 20 ft. in length may count towards down log requirements for retention/creation. At least 50% of these must be in decay class 1 or 2. Those damaged during harvest activities should be replaced. *(Damaged is defined as size reduced below minimum requirements).*
- Consider the expected needs of existing populations of wildlife and botany species. Provide for minimal disturbance while maximizing down log habitat retention and creation. This should be evaluated on a site-specific basis and used to meet the length, diameter, or decay class requirements where appropriate.
- Prioritize retention and protection of some large diameter down logs, highly decayed logs, and areas with high concentrations of down logs (clumps) where this would be a benefit to wildlife, plant, or fungal species. This should be evaluated on a site-specific basis and used to meet the length, diameter, or decay class requirements where appropriate.
- Create 240 linear feet/acre at time of harvest with the remainder of wood created within 10 years. This delay is suggested to allow for windthrow mortality.
- If new logs are necessary to meet the required totals, create new sound down logs by falling trees > 20" diameter (see Table F-9 to determine the number of trees needed to meet the average linear feet/acre requirement).
- Only conifer species may be used to meet log creation requirements. Species mix should be representative of that existing in the stand overstory (e.g., if the dominant overstory species is Douglas-fir and the under or mid-story is dominated by a large number of western hemlocks, the majority of the down wood created should be of Douglas-fir). In positions adjacent to fish-bearing streams, emphasis should be placed on the creation of cedar logs.
- Do not create logs exclusively from overstory remnant (legacy) trees.
- Consider marking and mapping all created logs for tracking or retention purposes.

Riparian Areas – See direction in Snag management in Riparian Reserves

Table F-9– The number of 20-foot log segments available in trees of various diameters and the number needed to meet various down log requirements (linear feet/acre)					
DBH	**Height (ft.)**	**# Pieces 20 ft. Long**	**# Trees/acre needed to create 240 linear feet/acre**	**# Trees/acre needed to create 300 linear feet/acre**	**# Trees/acre needed to create 400 linear feet/acre**
20	**20**	**1**	**12**	**15**	**20**
22	**20**	**1**	**12**	**15**	**20**
24	**20**	**1**	**12**	**15**	**20**
26	**40**	**2**	**6**	**7.5**	**10**
28	**60**	**3**	**4**	**5**	**7**
30	**60**	**3**	**4**	**5**	**7**
32	**80**	**4**	**3**	**3.8**	**5**
34	**80**	**4**	**3**	**3.8**	**5**
36	**100**	**5**	**2.4**	**3**	**4**
38	**120**	**6**	**2**	**2.5**	**3.4**
40	**120**	**6**	**2**	**2.5**	**3.4**
42	**120**	**6**	**2**	**2.5**	**3.4**
44	**140**	**7**	**1.6**	**2.2**	**2.7**
46	**140**	**7**	**1.6**	**2.2**	**2.7**
48	**140**	**7**	**1.6**	**2.2**	**2.7**
50	**140**	**7**	**1.6**	**2.2**	**2.7**

Table F-10 – Description of Snag Decay Classes

A 5-class system of snag decomposition based upon work done on Douglas-fir in Western Oregon (reproduced from Maser et al. 1988, adapted from Cline et al. 1980)

	Stage of Deterioration (Decomposition class)				
Snag Characteristics [B]	**1**	**2**	**3**	**4**	**5 [A]**
Limbs and branches	**All present**	**Few limbs, no fine branches**	**Only limb stubs**	**Few of no stubs**	**None**
Top	**Pointed**	**Broken**			
Diameter, broken top	**Increases at decreasing rate**				
Height	**Decreases at decreasing rate**				
Bark remaining (%)	**100**	**Varies**	**Varies**	**Varies**	**>20**
Sapwood presence	**Intact**	**Sloughs**	**Sloughs**	**Sloughs**	**Gone**
Sapwood condition	**Sound, incipient decay, hard, original color**	**Advanced decay, fibrous, firm to soft, light brown**	**Fibrous, soft, light to reddish brown**	**Cubical, soft, reddish to dark brown**	
Heartwood condition	**Sound, hard, original color**	**Sound at base, incipient decay in outer edge of upper stem, hard, light to reddish brown**	**Incipient decay at base, advanced decay throughout upper stem, fibrous, hard to firm, reddish brown**	**Advanced decay at base, sloughing from upper stem, fibrous or cubical, soft, dark reddish brown**	**Sloughing, cubical, soft, dark brown, fibrous , very soft, dark reddish brown, encased in hardened shell**

[A] **Mostly remnant snags**

[B] **Characteristics of a snag at each of the 5 stages of deterioration**

Appendix G
Steps in the development of the Middle McKenzie Landscape Design

Appendix ?? Steps in the development of the Middle McKenzie Landscape Design

- Bear Marten Watershed Analysis was completed April 1996
- Public Meeting to discuss the watershed analysis held in Spring 1996
- Middle McKenzie Landscape Design started Fall 1998
- An article on the Middle McKenzie Landscape Design was included in the Eye to the Future, the Eugene District planning newsletter on April 1999, July 2000, and February 2001 issues
- An article on the Middle McKenzie Landscape Design was included in the Central Cascades Adaptive Management Area Newsletter in the Winter 1999/2000, Fall 2000 and Summer 2001 issues
- Middle McKenzie Landscape Design draft was completed April 2001
- Copies of the Draft given to selected Researchers and Agency personnel for comments
- Field trip with members from the Level 1 Fish Consultation Team on July 2001
- Document finalized on January 2002

REFERENCES

Applegarth 1994, USDI BLM, March 1994, Special Status Amphibians and Reptiles of the Eugene District - A Guide for Their Conservation Eugene District Office.

Applegarth 1995, USDI BLM, December 1995, Invertebrates of Special Status or Special Concern in the Eugene District, Eugene District Office.

Brown, E. R., tech ed. 1985. Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington. Part 1- chapter narratives. 332 pp. Part 2 - appendices. 302 pp. USDA Forest Service, Pacific Northwest Region, Portland, Oregon.

Brown, M., Kertis, J. and M. Huff. *In prep.* The Warner Creek Burn: Structure and Composition of Forests in the Oregon Cascades 1-2 and 6-7 Years After a Fire..

Bull, E. L., C. G. Parks, and T. R. Torgersen. 1997. Trees and Logs Important to Wildlife in the Interior Columbia River Basin. Companion to General Technical Report, PNW-GTR-390. USDA Forest Service, PNW Research Station.

Butts, S. R. 1997. Association of Forest Floor Vertebrates with Coarse Woody Debris in Managed Forests, Western Oregon Cascades. 60 pp. MSc Thesis, Oregon State University.

Christy, J.A. 2000. Personal communication.

Christy, J.A. and D.H. Wagner. 1996. Guide For the Identification of Rare, Threatened or Sensitive Bryophytes in the Range of the Northern Spotted Owl, Western Washington, Western Oregon, and Northwestern California. Bureau of Land Management, Oregon-Washington State Office, Portland, Oregon.

Cissel, J.H., Swanson, F.S., Weisberg, P.J. 1998. Landscape Management Using Historical Fire Regimes:Blue River Oregon. USDA Forest Service Willamette National Forest and Pacific Northwest Research Station and Department of Forest Science, Oregon State University.

Cline, S. P., Berg, A. B., Wight, H. M. 1980. Snag characteristics and dynamics in Douglas-fir forests, western Oregon. J. Wildl. Manage. 44(4):773-786.

Fogel, R., M. Ogawa, and J. M. Trappe. 1973. Terrestrial decomposition: A synopsis. Coniferous Forest Biome Report. University of Washington, Seattle. 135 pp.

Franklin, J. F., and Waring, R. H. 1980. Distinctive features of the Northwestern coniferous forest: Development, structure and function, *in* Forests: Fresh Perspectives from Ecosystem Analysis. Proceedings 40th Biology Colloquium (1979). R. H. Waring, ed. Pp 59-85. Oregon State University Press, Corvallis.

Harmon, M. E., and J. Sexton. 1996. Guidelines for measurement of woody detritus in forest ecosystems. Publication No. 20. U.S. LTER Network. Office: University of Washington, Seattle, WA, USA. 73 pp.

Harmon, M. E., J. F. Franklin, F. J. Swanson, P. Sollins, S. V. Gregory, J. D. Lattin, N. H. Anderson, S. P. Cline, N. G. Aumen, J. R. Sedell, G. W. Lienkaeemper, K. Cromack, and K. W. Cummins. 1986. Ecology of Coarse Woody Debris in Temperate Ecosystems. Advances in Ecological Research, Vol. 15. 302 pp.

Hemstrom, M. A., S. E. Logan, and W. Paviat. 1987. Plant Association and Management Guide, Willamette National Forest. USDA Forest Service, PNW R6-Ecol 257-B-86. Portland, Or. 312 p.

Holthausen, R. H., R. Anthony, K. Aubry, K. Burnett, N. Fredricks, J. Furnish, R. Lesher, E. C. Meslow, M. Raphael, R. Rosentreter, and E. E. Starkey. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. Appendix J2 - Results of Additional Species Analysis. UDSA-FS, USDI-BLM, 1994.

Irwin, Larry

Keon, D. 2000. Personal communication.

Maser, C., R. Anderson, K. Cromack Jr., J. T. Williams, and R. E. Martin. 1979. Dead and down woody material *in* Wildlife Habitats in Managed Forests, the Blue Mountains of Oregon and Washington. J.W. Thomas, ed. USDA Forest Service. Agriculture Handbook. 553 pp. Washington Office, Washington D.C.

Maser, C. and J. M. Trappe, tech eds. 1984. The seen and unseen world of the fallen tree. PNW-GTR-164. Portland, OR; USDA Forest Service, PNW and Range Experiment Station. 56 pp.

Maser, Z., C. Maser and J.M. Trappe 1985. Food habits of the northern flying squirrel (*Glaucomys sabrinus*) in Oregon. Canadian Journal of Zoology 63: 1084-1088.

McCune, B. 2000. Personal communication.

McCune, B. 1998. *Hypotrachyna riparia*, a new lichen from western North America. The Bryologist 101(3): 448-450.

Morrison, P. H. and F. J. Swanson. 1990. Fire History and Patterns in a Cascade Mountain Landscape. USDA Forest Service, Pacific Northwest General Report, PNW-GTR-254. 77 p.

Neitlich, P.N. and B. McCune. 1997. Hotspots of epiphytic lichen diversity in two young managed forests. Conservation Biology 11(1): 172-182.

Nietro, W. A., R. W. Mannan, D. Taylor, V. W. Binkley, B. G. Marcot, F. F. Wagner, and S. P. Cline. 1985. Snags (Wildlife Trees) *in* Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington. Part 1- chapter narratives. 332 pp. Brown, E. R., tech ed. 1985. USDA Forest Service, Pacific Northwest Region, Portland, Oregon.

Ohmann, J. L., W. C. McComb, and A. A. Zumrawi. 1994. Snag abundance for primary cavity-nesting birds on nonfederal forest lands in Oregon and Washington. Wildlife Society bulletin. Winter 1994. v. 22 (4) p. 607-620.

Oregon Department of Environmental Quality, 1998. 1998 303(d) Water Quality Limited Bodies List

Peck, J.E. 1997. The association of commercially harvestable bryophytes and their host species in northwestern Oregon. The Bryologist 100: 383-393.

Peterson, E.B. 2000. Analysis and Prediction of Patterns in Lichen Communities over the Western Oregon Landscape. Ph.D Dissertation, Oregon State University, Corvallis, Oregon.

Pettersson, R.B., J.P. Ball, K. Renhorn, P. Esseen and K. Sjoberg, K. 1995. Invertebrate communities in boreal forest canopies as influenced by forestry and lichens with implications for passerine birds. Biological Conservation 74: 57-63.

Rosso, A.L. 2000. Shrub Epiphyte Communities in Relation to Stand Management in Forests of Western Oregon: Effects of Overstory Thinning. Ph.D Dissertation, Oregon State University, Corvallis, Oregon.

Ruchty, A and B. McCune. 2000. The association of epiphytic lichens and bryophytes with riparian stand types along a valley continuum, Oregon Coast Range. Manuscript in progress.

Sollins, P. 1982. Input and decay of coarse woody debris in coniferous stands in western Oregon and Washington,. Canadian Journal of Forest Research 12:18-28.

Spies, T. A. and J. F. Franklin. 1991. The structure of natural young, mature, and old-growth Douglas-fir forests in Oregon and Washington. Pages 91-109 in L.F. Ruggiero, K. B. Aubry, A. B. Carey, and M. H. Huff, eds. Wildlife and vegetation of unmanaged Douglas-fir forests. USDA Forest Service PNW-GTR-285.

Spies, T. A. and S. P. Cline. 1988. Coarse Woody Debris in Forests and Plantations of Coastal Oregon *in* C. Maser, R. F. Tarrant, J. M. Trappe, and J. F. Franklin, eds. From the Forest to the Sea: A Story of Fallen Trees. USDA Forest Service, PNW-GTR-229, Portland, OR.

Spies, T. A., J. F. Franklin, and T. B. Thomas, 1988. Course woody debris in Douglas-fir forests of western Oregon and Washington. Ecology 69(6):1689-1702.

Thomas, J. W., R. G. Anderson, C. Maser, and E. L. Bull. 1979. Dead and Down Woody Material *in* Wildlife Habitats in Managed Forests, The Blue Mountains of Oregon and Washington. J. W. Thomas, tech editor. USDA Forest Service. Agriculture Handbook No. 553.

USDA & USDI, 1995. Little River Watershed Analysis. Unpublished analysis files, Umpqua National Forest, North Unpqua Ranger District, Glide, OR.

USDI BLM. July 1998. Bear/Marten Watershed McKenzie Resource Area. Eugene District Office.

USDI BLM. 1996. Vida/McKenzie Watershed Analysis McKenzie Resource Area. Eugene District Office.

USDA Forest Service, Blue River Ranger District, 1997. Blue River Landscape Project, Willamette National Forest,

USDA Forest Service and USDI Bureau of Land Management. 1994. Record of Decision for amendments to Forest Service and Bureau of Land Management Planning Documents within the range of the northern spotted owl. Standards and Guidelines for management of habitat for late successional and old-growth related species within the range of the northern spotted owl. USDA Forest Service, Bureau of Land Management. 74 pp.

USDA Forest Service, USDI BLM, USDI USFWS. 1998. South Cascades Late-Successional Reserve Assessment, Umpqua National Forest.

USDA Willamette National Forests, USDI Salem District BLM, USDI USFWS OSO. 1998. Willamette Late-Successional Reserve Assessment.

Weisberg, P. J. 1997. Fire History and Fire Regimes of the Bear-Martin Watershed and Some Relationships with Contemporary Stand Structures. Final report to the BLM, Eugene District.

Weisberg, Peter, J. 1998 - was this personnel communication

Wright, Pamela J. 1998. The Effect of Fire Regime on Coarse Woody Debris in the West Central Cascades, Oregon. M.S. Thesis, Oregon State University.